REPORT RESUMES

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A REVIEW OF SELECTED REFERENCES RELATING TO THE PLANNING OF HIGHER EDUCATION FACILITIES.

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A COMPILATION OF REVIEWS OF ARTICLES, BOOKS AND PAMPHLETS RELATIVE TO THE PLANNING OF HIGHER EDUCATION FACILITIES IS THE END PRODUCT OF A COURSE OF THIS TITLE OFFERED AT FLORIDA STATE UNIVERSITY. EACH REVIEW INCLUDES INFORMATION ABOUT THE AUTHOR, TITLE, JOURNAL AND DATE OF PUBLICATION WITH A BRIEF ABSTRACT OF THE CONTENT OF THE REFERENCE. THE REFERENCES ARE CONCERNED WITH AREAS IN PLANNING RELATIVE TO--(1) ORIENTATION TO EDUCATIONAL FACILITIES PLANNING, (2) DEVELOPING A MASTER PLAN FOR PLAN EXPANSION, (3) PLANNING THE INDIVIDUAL SCHOOL, (4) PLANNING THE TECHNICAL ASPECTS, AND (5) ADMINISTERING THE PLANT EXPANSION PROGRAM--PLANNING, FINANCING, COST AND ECONOMICS. (HH)

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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FOREWORD

This document is a compilation of reviews of selected references relating to the planning of facilities for higher education. The references included are a random selection of materials relating to general topics assigned as a basis for weekly reading by a college class. These readings were submitted by the students as partial fulfillment of the requirements of a course in the planning of higher education facilities at Florida State University.

Both the students and the professor agreed that such a compilation would be interesting and helpful to the student of higher education facilities planning. Additionally, this document should be of interest to the practitioner as a review of current thinking and practice in the planning of higher education facilities.

This compilation is not intended to represent a complete survey of the current literature in the field. The one hundred and eighty-seven reviews included were selected from approximately three hundred and thirty that were submitted for use.

ACKNOWLEDGEMENTS

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I

ORIENTATION TO EDUCATIONAL FACILITIES PLANNING

AASA School Building Commission. Planning America's School Buildings. Washington: American Association of School Administrators, 1960. pp. 1-5.

"The School Building - What is it?"

1. It is a symbol of the ideals of a free people.
2. It reflects the hopes and dreams for a better life.
3. It reflects the aesthetic values of the people.
4. Every clearly defined trend in the social or economic life of the people is reflected in its form.
5. It is an intergral part of the culture.
6. Over a long period of time, methods of instruction, philosophy of teaching and curriculum content are the forces which determine the character of the school plant.

Cultural Factors:

1. Predicted growth in school age population - from 170 million in 1957 to 250 million in 1982.
2. Educational expectations of the people are always upwards.
3. Science has made a great impact on society.
4. Influence of "guidance" - or developing each student to his utmost.
5. Mass-media in instruction has changed mores at home and in the school program.
6. Technology and automation has produced leisure time to pursue more education. Therefore the growth of adult education has increased.
7. Year around school programs with emphasis on planning are needed to meet the challenge.

Beggs, Walter K. "Some Demographic Factors in Schoolhouse Construction," National Council on Schoolhouse Construction: Proceedings, 1965. East Lansing, Michigan: National Council on Schoolhouse Construction, 1965.

It appears that a conservative estimate of schoolhouse construction needs over the next 25 to 35 years will amount to 150 per cent of the current plans. It has also been estimated that by the turn of the century our 350 to 400 million people will live in 13 tremendous population conglomeration; strip or linear cities. As new forces are generated because of the demographic factors that are involved in the national distribution of our population, we could get some very interesting changes in the population movements that will have definite implications. We may have to think of indigenous building modules which can be picked up and moved.

Another matter of consideration is the shifting patterns of educational needs. Beggs draws an analogy between the effects of the depression era and the modern age of cybernation. Cybernation has reduced the work opportunity for the unskilled, the semi-skilled, and even some of the white collar workers. When the effects of cybernation has hit the school system, we must translate our needs differently. Rapid growth in the junior colleges might be associated with this development. As educational plants are built for these young people and adults as well, we are going to have to think of what function the school plant is going to serve.

The author also points to implications of new educational media and advancing technology which will affect the school plant in the near and far future. The difficulties which can endure the accelerating growth and change of the next three or four decades will tax the skill and imagination of educational planners.

Blocker, Clyde E. "The Role of the Administrator in Community College Plant Planning," Junior College Journal, XXXI (February, 1961). 326-332.

In plant planning the administrator must work with and coordinate the efforts of the following groups or persons:

1. Board of control
2. Local citizens
3. Faculty
4. Students
5. Architects
6. Donors
7. State and Federal agencies.

The author then lists the qualities that a good administrator should possess for effectively handling the planning program:

1. Knowledge - in order to be a good coordinator.
2. Leadership - a positive performance in organizing and inspiring the various people involved.
3. Unity - through efficient communications to build an esprit de corps.

Bulat, Donald C. Architecture and The College. Urbana, Illinois: Department of Architecture, University of Illinois, 1966. (Paper read at North American Conference to Consider the Critical Issues in Campus Planning and College Building Design, April, 1966).

1. A review of planning for Miami-Dade North and South.
2. Steps in planning:
    a. Constant re-evaluation with architects and educators.
    b. Tight schedules for future buildings.
    c. Edspecs were delivered in time to be of value.
    d. Constant feedback and interaction in trouble spots.

3. Four broad areas of planning: educational, urban, campus and architectural. All were involved.
4. "The typical educator, together with the typical architect, directed by the typical administrator, cannot in this day conceivably deliver adequate or meaningful, up-to-date college facilities. . . There is a critical need . . . for the element which I have sensed is missing from so many college-faculty-creating teams: it is what I call the educational planner: He is an anticipator, a coordinator, a trouble shooter, an innovator, an evaluator, and a stimulator." (13)

Bursch, Charles W. and John L. Reid. "What Are These?" in _You Want To Build A School_? New York: Reinhold, 1947. Ch. 3.

The equipment and space which we find necessary in our daily living, plus the things that can sharpen experience and broaden development, should be found in the school plant in well related, organic form.

The schoolbuilding in itself is a powerful instrument of education. Standard designs, taken from a book or design code, should not be used for school buildings if they are to be effective educational tools.

The plant, above all, must be cheerful, inviting, stimulating; it must provide an environment for learning, working, and living that makes for richness of experience in learning.

Christiansen, Kenneth A. "Implications for New Media for Space and Building Design." _National Council on School-house Construction: Proceedings, 38th Annual Meeting, 1961_. pp. 33-40.

There is an increasing dependency on technology as a governing economic and social factor. Our schools cannot and will not escape this dependency. Prominent among the revolutionary concepts in education is the expanding role of educational TV and other instructional media.

Educators pondering the potential of the new media, center their concern on the questions of educational philosophy, pedogogy, costs, and the effectiveness of the new techniques. But design and space, the architectural problems, have not always been recognized.

Architecture and design are concerned with:
1. Student relationships to the aids and media.
2. Production, distribution, origination, recording and storing functions as they apply to the new media.

By training and innate feel, the architect is capable of executing factors like shape, proportion, materials, lighting, color, and acoustics for their psychological effect. The use of functional values as applied to new media may be a problem for him unless function is clearly communicated by those responsible for planning the educational program.

The shape of the space will be determined by the activities of the learners. Viewing and hearing and discussion are two major activities to be considered and defined. Much use of space may be accomplished by flexibility which permits: 1) changing and rearranging seating and furniture as required by, 2) movable partitioning, and 3) adjacency of areas for related activities.

Clapp, Wilfred F. "Trends in School Building: The Atmosphere." The School Executive, LXXV, (August, 1956), 70-72.

Environment affects learning. Real learning is the result of total experience in an environment.

It is important that a school building be one that a student will react to constructively. To get this kind of building, there must be a desire on the part of school authorities for an attractive building, with emphasis on humanness. The architect must also have a real desire to create this type of building.

Both the client and the architect, perhaps in different degrees, must have an understanding of students, how they react and how they learn and grow. There must be mutual confidence between the architect and the client and mutual understanding of problems and viewpoints.

First impressions of a building are important. It should look like an interesting place in which to learn and work together. The proper location on an ample, attractively landscaped site helps to create the desired impressions.

The impression of the exterior should be continued into the building, with warm and interesting finishes used to create the desired atmosphere. Attempts to design both the program and the building with an emphasis on human values and group living leads to the "lobby" being enlarged to become a student commons.

The creation of a good atmosphere comes from the coordination of size, finishes, color, visual conditions, acoustics, and thermal conditions with the desire to have a friendly building.

Day, H. Summerfield. "What a University Architect Does Before, While and After You Build," College and University Business, XXXIV, (March, 1963), 73-75.

Mr. Day, staff architect for the University of Illinois, identifies two functions which the staff architect performs:

1. Provides professional knowledge for the university.
2. Administers the college's physical plant development.

An important subphase of this activity occurs during the planning of a new building. During this phase, the architect should:

1. Sit with the building committees and provide assistance as requested.

2. Inform the committee as to the kinds of information he will need to transform their educational goals into physical structures.
3. Assist in the site selection and planning.
4. Assist in selection of the outside architect.
5. Review the written program (edspecs) with the outside architect.
6. Review the architect's preliminary drawings - and review all drawings and plans frequently as they develop and change.
7. Investigate the construction contract bidders and advise concerning selection.

In addition, the staff architect should perform research to ascertain norms, standards cost data, materials, equipment, etc.

Dober, Richard P. "Outlook" and "Campus Design In Perspective", Campus Planning, New York: Reinhold, 1963. pp. 3-41.

1. Physical Plant Characteristics - Public, 154 acres; Private, 61 acres - 40,000 buildings in 1957 - not enough long-range plans.
2. Benchmarks in Campus Design.
   a. Colonial Colleges: 1636-1780. Little overall planning.
      1. Building types are most important--Georgian.
      2. First "Premeditated architectural composition"--William and Mary, 1699. Williamsburg, Virginia. Axial Composition.
      3. John Trumbull (1792) laid out a plan for Yale which was rejected. He was a landscape advocate. Long block of buildings.
   b. Early America: 1780-1865. Beginnings of planning.
      1. Joseph Rameę (1813) made first campus plan for Union College in Schenectady, N. Y. An axial, symmetrical plan.
      2. Jefferson developed a plan for the University of Virginia that remains today almost unchanged.
      3. Colleges went with Western Migration with little planning. Greek Revival became the style.
   c. University Tradition (1865 on) shows little originality till 1930's. English models prevailed. However, planning was spurred on by competition for designing California colleges.
3. Today, the campus plan must be adaptable to change and at the same time, integral in design.

Du Von, Jay. "The Campus Landscape," American Education, II (May, 1966), 18-24.

This article deals with the work of the landscape architect in general and the work that has been done at Grand Valley College, the University of California, Southern Illinois University, and Florida Presbyterian College. In each case an effort was made to combine good form with good function in making the finished product look as if it were part of the terrain. At Grand Valley College in particular, a problem of ravines was turned into an asset.

According to the author, the landscape architect and the architect working together, "create an esthetic statement of what a campus is." They give the campus "a sense of identity."

Gleazer, Edmond J., Jr. "Facilities Outlook for Junior Colleges," American School & University, XXXIX (February, 1967), 62.

1. Junior college enrollments are increasing rapidly and many new two-year colleges are being established each year. During the next ten years there will be increased community and junior college construction.
2. The money for this construction will come from public funds and the American people will expect these new facilities to reflect excellence in planning and construction.
3. New types of facilities will be seen as there will be new innovations and experimentation in building. The colleges will serve as community cultural and social centers. In the urban areas multi-campus systems will continue to develop.
4. Junior college people are challenged to see that quality emerges from this tremendous growth.

Hare, John. "Flexibility: Can it Stave off Building Obsolescence?" College and University Business, XLII (June, 1967), 51-52.

There are a multitude of changes going into the curriculum and teaching procedures of today. These all call for changes in the physical plant. We can assume that further changes will be dictated at the same rate in the future. Thus, any plant which is built with today's curriculum and teaching process in mind will soon be obsolete. To overcome this, provision must be made for change or they must provide for FLEXIBILITY.

Four types of Flexibility.

1. Expandibility: provision to "add-on" either horizontally or vertically.
2. Change in relative demand: thus we move to Biochemistry in place of biology and chemistry. Perhaps we should make a complete change in organization of the plant.
3. Provision of services: this pertains to the labs where services are provided for conversion on a lab to a different type.
4. Convertibility: easy conversion to a different kind of use. Actually this would be multipurpose.

Harris, Norman C. "On Being a Consultant", Junior College Journal, XXXVII (April, 1967), 9-13.

An excellent article on the role of the consultant in educational planning. It examines the need for outside consultants, and then looks at their work in these areas:

1. Feasibility studies.
2. Master Plan studies.
3. Curriculum development.
4. Campus development.
5. Faculty Workshops.
6. Improving guidance services.
7. Examination of the administrative roles in education.

The article concludes with some thoughts on actual consultant practice.

Henderson, Lee G. and Cramer, H. L. "Educational Planning For Community Junior College Facilities," The Florida Architect, XIV (June, 1964), 15 ff.

1. Planning "is a cooperative venture requiring teamwork between the educator and architect which should be based upon mutual respect and understanding." (34)
2. Educational planning involves five steps:
    a. Determination of goals, philosophy and programs.
    b. Calculation of quantitative space requirements.
    c. Determination of qualitative aspects of spaces.
    d. Preparation of written educational specifications.
    e. Review of architectural plans in light of edspecs.
3. The legal documents are:
    a. The building survey report covering the first three steps listed above plus long-range planning.
    b. The educational specifications which provide a communication between educator and architect of the educational program of the new facility.
4. Responsibilities in planning:
    a. Edspecs stage - Educator in charge; architect is observer and consultant.
    b. Architectural Planning - Architect is the designer; educator is advisor and reactor.
5. There is a continuing need for long-range planning of programs, of facilities and of sites.

Horn, Francis H. "Meeting Higher Education's Physical Plant Needs," American School & University, XXXIX (February, 1967), 40-41.

1. Colleges and universities are faced with a doubling of enrollment in the next ten years. The existing physical facilities must also be doubled and many of our present structures will need to be renovated.
2. The people in the United States will meet the financial needs of this program but the major problem will be the quality of the campus architecture. Education of the future will be subject to continuous change. Will present construction efforts meet the needs of the future?

3. Present planning and construction must provide for buildings which are flexible and equipped for the latest "gadgetry." There is also a shortage of maintenance and repair.
4. More important than all other considerations is the student. He must be kept in mind and we must be cautious not to overdo the modern approach. The total environment of "climate of learning" of the educational plant is very important.

MacConnell, James D. "The Specialist's Role in School Planning", Planning for School Buildings. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1956. pp. 75-100.

Two distinct groups involved in planning school facilities:

1. Educational Group: Concerned with the educational aspects and are "experts" in the educational matters.
    a. Governing Board: Has ultimate responsibility for the entire program.
    b. School Superintendent: Primary education executive to the board.
    c. School Professional Staff: Provide information within their specialties since they will be using the plant.
    d. Noncertified or Classified Staff.
    e. Educational Consultant: Specialists in school plant construction planning.
    f. Other Groups such as; financial, legal and insurance advisors.
2. Technical Group: Function in similar manner to that followed in ordinary construction, but to a larger extent because the requirements are frequently less clear.
    a. Architect: Designs and supervises construction.
    b. City Planner.
    c. Engineers of varying specialties.
    d. Governmental Agencies: Advise on procedures, regulations and technical matters.

McCrary, Nile O. "A Study of the Factors Involved in Establishing Guidelines for Planning School Plants." National Council on Schoolhouse Construction: Proceedings, 1965. East Lansing, Michigan: National Council on Schoolhouse Construction, 1965. pp. 54-59.

The study identified elements commonly found in or recommended for inclusion in programs of school plant planning in Tennessee.

1. Determine school plant needs - primarily by long-range planning.
2. Development of standards and educational policy - school board, state, etc.
3. Selecting an educational consultant.
4. The public relations program.

5. Legal problems and services.
6. The school plant survey.
7. Planning the educational program.
8. Preparation of the educational specifications to provide a written guide to the architect.
9. Site selection and acquisition.
10. Architectural services.
11. The financial program.
12. Construction services:
    a. bidding and letting contracts
    b. supervision of construction
13. Selecting furniture and equipment.
14. Accepting and occupying the building.

If these steps and processes were only followed, the school building program would be increased in quality significantly.

National Citizens Commission for the Public Schools. What Are Our School Building Needs? New York: The Commission, 1955. 74 pages.

This booklet is divided into five sections followed by some twenty-two checklists concerning broad areas of building needs. The sections concern:

1. The determination of needs.
2. Possible alternatives to building new facilities and methods for evaluating these alternatives.
3. The problems of planning with special concern for ways of selecting the architect, considerations for site selection, and comments on design, building codes, etc.
4. Financing the plan.
5. Obtaining the Board's endorsement of the Plan.

Though the booklet includes a vast array of important topics, the coverage is too brief and superficial to be of great value. The checklists at the end of the volume are probably the most valuable aspect of the book.

Priest, Bill J. and H. Deon Holt. "How to Organize for Facilities Planning," Junior College Journal, XXXVII (March, 1967), pp. 30-32.

1. Develop a planning staff as knowledgable as possible and supplement it by using the capabilities of faculty and consultants.
2. Basic guidelines for planning:
    a. Begin with an adopted statement of policy.
    b. Put responsibility for coordination of planning in one person directly responsible to the president.
    c. Define the roles of the planning participants.
3. The planning specialist is chiefly concerned with master plans, edspecs, and architectural coordination.
4. Use faculty in planning committees for each area.
5. Desirable "skills" for a planning specialist:
    a. Generalist knowledge of college operation.
    b. Sold on philosophy of institution.

   c. Familiar with architecture and construction.
   d. Skill in research, particularly institutional research.
   e. Strong in human relations.
   f. Skill in oral and written communications.
   g. Imagination, vision and creativity.

Proceedings: Conference on Junior College Facilities. Tallahassee, Florida: State Department of Education, 1959.

"This is a record of the major speeches and committee reports for a conference on Community Junior College Facilities which was held in Gainesville on April 10, 11, 1959." (ii) The Contents:

1. Florida's Community Junior Colleges - Thomas D. Bailey
2. Community Junior College Surveys: Curriculum - James L. Wattenbarger
3. Community Jr. College Surveys: Buildings - B. R. Tilley
4. Characteristics of Public Jr. College Facilities - Leon Henderson
5. Considerations in Site Selection - Kenneth Skaggs, Webb Allen
6. Principles of Campus Planning - William T. Arnett
7. Campus Planning for Florida Public Jr. Colleges - C. W. McGuffey
8. Basic Considerations in Planning - Henry L. Ashmore
9. Planning Public Community Junior College Facilities - Wortman, et al.
10. Cost Data - E. R. Coxen
11. Utilization of Instructional Space - Lee G. Henderson
12. Committee reports

Reed, Bob H. "People, Processes, and Time = Facilities," Junior College Journal, XXXVII (November, 1966) 20-25.

1. Planning Campus Facilities is a "total team" effort. Individual members contribute at varying points along the time scale, but all must cooperate with one another.
2. Two parts to the team:
   a. Educational
   b. Design
3. Major phases in planning: site selection, campus planning, and architecture--all broken down into subphases.
4. The KEY to achieving campus facilities is to employ the necessary team member at the right time--coordination.
5. The rationale behind planning must be documented to facilitate future evaluation.
6. "Programming is problem-seeking while design is problem-solving." (23) Programming is the most important prerequisite to good design.
7. The end product of campus planning is the "big picture" for ultimate development based on sound concepts.

8. "Everything which we do as planners should help to stimulate creative thought both from the educators and the design professions, establish a clear line of communication between the two groups, maintain an inquisitive attitude, and take nothing for granted."

Rushing, Joe B. "The Architect: Planning Partner", _Junior College Journal_, XXXVII (December, 1966), 29-30.

The president of a junior college should be employed early, a statement of philosophy developed, basic principles established, and the architect commissioned so that a close working relationship between educators and architects may be established in the earliest planning stages.

For better understanding, the architect should be involved in discussions of general policy guidelines and educational specifications rather than just being provided with written statements. The architect may also be involved in administrative decisions involving educational specifications. A third area of involvement for the architect is site selection, testing and evaluation.

It is recommended that administrator and architect jointly attend conferences on facilities, planning, and facilities legislation.

Administrator and director of planning should visit other junior colleges where good planning is evident, taking along a representative group and taking plenty of time.

Shannon, Robert L. "Tomorrow's Schools Today," _Florida Education_, XLII (March, 1965), 6-10.

1. A study of schools across the nation in order to prepare edspecs for USF Educational building (Funded by EFL).
2. "Educational leaders continue to encourage construction of spaces for education that get in the way of the very functions they are designed to serve." (6)
    a. Teachers and architects do not get involved in thinking through requirements for educational structures.
    b. Lay citizens are not educated to see needed transitions in construction of learning spaces.
    c. Educators seldom recognize the qualities essential in a good physical plant for education.
    d. Architects design exciting exteriors but poor interiors because they don't understand what is going on in the spaces they create.
    e. Administrators short-circuit planning and fail to find answers to fundamental questions before construction.
3. Some principles for direction in educational planning:
    a. People must be involved in the process.

   b. The absolute point of departure must be purpose.
   c. What activities are necessary to achieve purposes?
   d. What spatial qualities will contribute most to these activities?
   e. Edspecs must be provocative and communicative.
   f. One person must be liaison between architect and educator.
   g. There must be continual evaluation of ideas.
4. "The collision of the creative architect with the creative educator is essential if an outstanding place for learning is to be created." (8, Gores, EFL)
5. "Educators have strangely ignored the significance of the exterior shape of a building as a vital factor in school planning." (10)

Stade, Charles E.,"Effective Architect Plans Before He Pencils." College and University Business, XLI (November, 1966), 44-46.

Predesign inquiry involving the people who will use the buildings is an important part of the architectural process of creating effective buildings, according to an interview with a master plan specialist, an outstanding architect, to determine his thinking and methodology:

The architect must seek out original sources and meaningful patterns, "Challenge the teacher", gain understanding and cooperation of client for philosophy and methodology of planning and design, ask questions and visit with students and all other users of building before attempting architectural interpretation of needs.

Each school differs from every other. New architecture may be made to harmonize with old without attempting to "match," and space in and around buildings is as important as space within.

Tonigan, Richard F. "Emphasis on the Educational Environment," American School & University, XXXIX (February, 1967), 60-61.

1. There is a growing concern for excellence in school and college plants. There is a concern for beauty and safety; of necessity, building sizes are increasing.
2. Some degree of specialization has entered into the educational facilities planning profession but not a single college or university offers a doctoral program in this field. Even the U.S. Office of Education is not departmentalized in this area.
3. To properly manage facilities, universities need to develop professional, educationally oriented facility managers. If a facility is not managed properly, its usefulness is seriously impaired.
4. Many new school and college plants reflect the modern concepts of today's educational approach. The young student should want to go to school each day being influenced by the beauty of the facility itself.

Tonigan, Richard F. "New Plant Programs Ad Infinitum," American School & University, XXXIXL (September, 1966), 1967-68.

1. Despite the construction boom in recent years, a serious shortage of educational facilities still exists. There is also a need to rehabilitate old obsolete buildings and the federal government has not made plans for assisting colleges to maintain the billions of dollars worth of buildings being built each year.
2. Few new facilities were built between 1930 and 1950 and in the past ten years enrollments have been increasing rapidly.
3. New types of facilities which require extra planning and finances are needed. The buildings must be bigger and more complex; they will be more difficult to adequately maintain. Auxiliary areas are needed and more planning needs to be done for the multimedia approach to teaching.
4. All types of help and materials are available for facilities planning. Since education leads to more education, the problem will become even more serious. Educators need to utilize this available help in planning and building additional facilities.

Wattenbarger, James L. "Emerging Patterns in the Junior College," National Council on Schoolhouse Construction, 38th Annual Meeting, 1961, pp. 73.

Based upon the unique characteristics of the junior college, the following are implications for facilities planning and construction:

1. Increasing emphasis on occupationally oriented programs and community services programs of the college, ("Occupationally oriented programs represent the emerging junior college").
2. Factors related to the community should be taken into consideration in the development of the master campus plan, as well as individual buildings.
3. The library of the college must serve a specific need, provide places to study for commuting students.
4. There will be a need for varying size classrooms from seminars to large section spaces.
5. Multiple-use of classroom space will be important.
6. Junior Colleges will be expected to operate year round, this will require buildings in which climate is controlled.
7. Junior colleges will be expected to use the modern electronic devices used to augment the professional teachers' time.
8. Faculty office equipment and facilities will be extremely important because of the junior college counseling function.

9. Since these colleges are commuting colleges, there will be a need to provide ample parking space for automobiles.
10. Classes will be operated day and evening, requiring careful attention to campus lighting and window screening.

Wattenbarger, James L. "The Philosophy and Programs of Florida's Community Junior Colleges. The Florida Architect, XIV (June, 1964), 7-8.

The basic purpose of a junior college is to provide for a diversity of educational opportunities beyond the high school at the least possible cost to the student. This philosophy would provide educational opportunity for many young people which would not be available through other sources.

Florida law provides that:

1. College parallel courses be offered which are equivalent to freshmen and sophomore years at the university.
2. Junior colleges should offer vocational-technical education.
3. Courses for adults be offered.

Collectively, all of these point up the strong responsibility the junior college has to provide guidance and counseling services.

Factors of operation, such as the 7:00 a.m. to 10:00 p.m. schedule, the wide range of age group, the need for the "collegiate spirit", and the allowance for adult opportunity; these all require careful attention to campus planning. The special need for flexibility of structure to enable the offerings to evolve to meet the changing needs of the community served is a most important consideration. In no other educational institution is there more opportunity for sound educational planning procedures which reflects the philosophy of the institution than in the community junior colleges of Florida.

Womack, Darwin W. "Role and Training", National Council on Schoolhouse Construction: Proceedings, 1964. East Lansing, Michigan: National Council on Schoolhouse Construction, 1964. pp. 59-62.

1. The school plant specialist is not one man but the leader of a large team. His chief responsibility is to identify problems and then find the people who can find solutions.
2. He is involved with not only the school and the school system, but also with nearly every department of the city, state, and county government.
3. The education facilities planner should be educated as a teacher-administrator with major emphasis on school plant planning.

II

DEVELOPING A MASTER PLAN FOR PLANT EXPANSION

Long-Range Planning For Facilities Development

Boles, Harold W. Step by Step to Better School Facilities. (New York: Holt, Rinehart, and Winston), 1965, pp. 19-64.

Knowledge of the curriculum is essential to any kind of school construction as it consists of a process of describing the predetermined experiences of the students within school facilities. Without this the unique curriculum needs of a particular institution may be ignored and a plant constructed that is educationally obsolete before it is occupied.

Jobs to be done in projecting school plant needs:

1. Projecting the curriculum
2. Projecting enrollment
3. Total facilities needs
4. Study of existing facilities

Bowen, Howard R. "How to Plan Around Things That Can't Be Planned", College and University Business, XXXV (July, 1963), 31-33.

Long-range planning, as a major concern of academic administrators, is attributed to the influence of:

1. Swiftly growing tasks
2. Financial anxieties
3. The Ford Foundation
4. Sidney Tickton.

The institutional environment that influences the planning process is dominated by the demand for and the supply of higher education. The expansibility of supply requires realistic appraisals of future enrollments, admission and educational standards, and student fees.

Positive and negative factors affecting student fees, gifts and endowment income are discussed as environmental influences. Expenditures as environmental influences on planning budgets are categorized and analyzed in terms of:

1. Faculty salaries
2. Nonacademic workers' wages
3. Construction cost
4. The rising standard of living
5. The growth of knowledge

The necessity of compromise serves to emphasize that the virtue of planning is that it helps us to foresee problems and to prepare for them, and that it helps us to define our goals in realizable terms.

Two dangers of planning are:

1. That the plan will be taken too seriously and followed too slavishly with a resulting loss of the imaginative flexibility needed to grasp unforeseen opportunities as they appear.
2. That planning introduces a bias toward conservatism.

"We must not let the planning process stultify our imaginations, impair our flexibility, or cause us to think too small.

Brotherton, R. Philip and Charles William Brubaker. "Analyzing Master Plan Influences." Junior College Journal, XXXVII, No. 7 (April, 1967), 22-27.

1. A master plan is unique because its educational programs, community and site are unique.
2. It develops "from an analysis of need, site, growth and finance, etc., and then from creative synthesis wherein the separate elements are combined to create a unified whole (a 'master plan') which will then guide future development of the college". (22)
3. Planning begins with a detailed inventory of facts which provide a firm foundation for creative planning.
4. The plan is influenced by ed. program, scheduling, growth and finance, technology, geography, climate, transportation, neighborhood and community needs.

Bursch, Charles W. and John L. Reid, "What Are These?" in You Want To Build A School? New York: Reinhold, 1947. Chapters 4 and 5.

The master plan is a complete, comprehensive, and long-range plan made by a school district to meet the anticipated growth of a school system over a period of years.

1. The first part considers and evaluates needs.
2. Part two declares educational policy.
3. Part three is the architect's master plan.
4. Part four is the financial plan for funding.

The classroom, no matter whether innovated or modern in design, will not automatically produce an excellent educational experience - but it depends on the skill and knowledge of the teacher in its use and performance.

Butler, John H. "College Planning," College and University Business, XXVIII (January, 1960), 23-25.

Long-range planning is a must for each and every educational institution.

For effective long-range planning a school should obtain the services of qualified professionals in the following areas:

1. Master planning
2. Architect planning
3. Educational planning

Each of these fields are distinct, yet essential to good planning. None of the three planners should attempt to function in the other's field.

The educational planner assists the institution in translating into print the needs and functions of the facility.

The master planner relates the facility to the total plant by arranging the development of the site so as to avoid wasting of funds, impairing of educational functions, and the marring of campus beauty.

The architect converts these ideas and policies into bricks and mortar capable of carrying out, with efficiency and pleasing effect, the mission for which the building was intended.

(Campus Planning), College Management, II (June, 1967) 38-39.

When planning a campus, the following steps are important according to Perkins and Will Partnership, an architectural firm:

1. Define objectives.
2. Establish basic criteria (Enrollment, class size).
3. Select a suitable site.
4. Establish space needs.
5. Establish functional relationships (shared space).
6. Establish size of spaces.
7. Assess existing facilities.
8. Services and utilities.
9. Establish and reserve land use.
10. Develop master plan drawing.
11. Develop an action plan.
12. Explain your design philosophy.

Carothers, Neil J. "University Circle Institution Rounds Out Urban Site." College and University Business.XXXIV, (May, 1963).

This article reports a unique approach to a long-range planning and development technique which can be beneficial to some colleges and universities in urban areas.

There are 29 members of the University Circle Development Foundation located in the heart of urban Cleveland. The group includes institutions of learning, Case and Western Reserve, several hospitals, seven churches, museum of art and natural history, institutes of art and music, and the Cleveland Symphony Orchestra. These institutions banded together formally to accomplish a twenty year master plan for the Circle. After the plan was developed, the Foundation was incorporated as a non-profit organization to put the plan into action. Each member accepted written conditions governing their future development, this giving up some of their individual sovereignty for the common good.

To the Foundation each institution has yielded its right to acquire land. This is done by the principles laid down in the master plan. All institutions are pledged to follow patterns of expansion laid down in the master plan. After five years no member institution has cause to regret in belonging to the foundation. The Circle has become the city's cultural, educational, and medical center and has a student and staff population of 18,000. "There is every reason to believe that the master plan for University Circle will not only be realized but will be far surpassed by the achievements of member institutions."

This appears to me to be an example of a cooperative technique which institutions in urban areas can use to gain more effective use of the limited space which they have for expansion.

Crosland, Robert L., McGuffey, C. W. and Wattenbarger, James L. *Master Planning: The Development of Florida's Community Junior College Campuses*. Tallahassee, Florida: State Department of Education, 1959.

Guidelines for Campus Planning in Public Junior Colleges.

1. Functions of the junior college:
    a. Provision for first two years of college work
    b. Provision for general education for individual betterment.
    c. Provision for development of post-high school vocational programs.
    d. Provision for continued educational guidance services.
    e. Provision for desirable and needed community services.
2. Curriculum development must be reflected in the facilities.
3. The term "Master Plan" does not mean a static map; rather, it is a logical and orderly pattern for growth and possible change.
4. Factors for consideration in junior college campus planning:
    a. Selection of site - size, location, natural conditions, shape.
    b. General composition - development phases, natural beauty, unity yet freedom for growth, zones or groups by activities, close-knit relationships, community service buildings should have public access, athletic areas adjacent to locker facilities, central mechanical plant.
    c. Traffic flow - peripheral, controlled, direct access, adequate.
    d. Architectural design - multi-purpose, minimum maintenance, natural lighting and ventilation, expandable utilities, safety.

Dober, Richard P. "Survey and Analysis of Existing Conditions." Campus Planning, New York: Reinhold, 1963. pp. 182-198.

1. Purposes of surveys
    a. Land use and physical elements of environs.
    b. Discovering deficiencies in the physical plant.
    c. Identifying conditions which will affect further development.
2. Survey based on topographic survey and accurate maps of environs.
3. Analytical field studies are made to determine:
    a. Site data
    b. Building conditions
    c. Space utilization
    d. Circulation and parking
    e. Utilities
    f. Visual design form of campus
    g. Historic buildings and sites
    h. Town and gown relationships.
4. Communications of materials accumulated is important.
5. Reference documents for reporting results:
    a. Overall map
    b. Site analysis map
    c. Campus diagrams
    d. Problem map
    e. Statistical summaries
    f. Environmental conditions
    g. Site availability study
6. Planning must be seen as a continuing activity.

Giles, Frederic T. "Guidelines for Junior College Campus Planning," Junior College Journal, XXXII (April, 1962), 471-475.

During the past ten years there has been increased interest in planning and building of junior college campuses. The phenomenal growth of the junior college is expected to continue and additional construction of facilities will be necessary.

These suggestions on campus planning were selected by experts who had actually planned a junior college campus. Included were architects, college administrators, and planning consultants who represented various geographical regions of the United States.

The general objectives considered important in facilities planning are as follows:

1. Be designed to implement the comprehensive junior college program.
2. Be designed to enhance the community junior college philosophy.
3. Be designed for the regular, part-time, and evening programs.
4. Be planned for use by the total community.
5. Be designed to provide flexibility for changing enrollments and changing program.
6. Be designed for low maintenance and upkeep.
7. Be so designed that it can be staffed economically.
8. Be beautiful, simple, and inexpensive.

To intelligently plan a campus, an extensive research and study program should also be conducted and other campuses should be visited. The planning of the campus should be a community-wide commitment to include the board of education, lay citizens, students, faculty, and administration. The role of each of these groups in the planning process should be clearly defined.

Jamrich, John X. "The Planning Process," To Build or Not to Build. New York: Educational Facilities Laboratories, 1962. pp. 7-11.

A new college building is a synthesis of the reasons for its existence; a physical translation of the academic philosophy, policies, expectations, and needs of a particular institution.

Certain basic considerations are common in determining the procedures used to analyze building needs. To deal with the total problem requires a total study of all the facets and functions of an institution.

Even where outside professional planning consultants are used by the institutions, substantial involvement of continuing members of the faculty and administrative staff should be encouraged in this planning process.

A faculty-administration-board of trustees committee should be established. Subcommittees would have to play an important role.

The following studies should be undertaken before embarking on a building program:

1. A detailed analysis of the present instructional plant.
2. A thorough and detailed analysis of the instructional plant.
3. A detailed study of the characteristics of the students.
4. A careful analysis of the financial structure.
5. A study of past, present, and projected enrollments.

Assuming that these studies add up to a need for a new instructional facility, the specific nature of this building must then be determined. At this point, the appropriate faculty and administrative committee, with the assistance of a competent architect, should embark on the determination of the exact type of building required including its size, location, and design.

McGuffey, C. W., Master Plan Study of School Facilities; Report to the Board of Education of the Hall County Schools, Gainesville, Georgia. Tallahassee, Florida: The Associated Consultants in Education, March, 1965, Ch. I.

The Purpose of the Study is:

1. Determine existing and long-range needs for school facilities in Hall County - 1965-75.
2. Review and analysis of:
   a. How many children expected to be served, 1970-75?
   b. What grade organization plan should be adopted?

c. What major changes in curriculum are likely to be made that will have significant implications for new school facilities?
d. How many and what kind of physical facilities will be needed to house the projected number of students adequately?
e. Which existing centers should have new facilities added?
f. Where should new schools be located?
g. How much will it cost to construct adequate physical facilities for 1970? For 1975?

McGuffey, C. W., et al. Long-Range Planning for Seattle Community College, Tallahassee, Florida: The Associated Consultants in Education, 1966.

A long-range facilities plan developed for Seattle Community College. The general steps used in making the critical decisions involved in this report are as follows:

1. A background detailing the growth of the community college movement on national, state (Washington), and local (Seattle) levels is presented for review purposes.
2. The purpose for making the report and the basic concepts to be followed are explained to the reader.
3. The Seattle Community College enrollment potential is projected to 1975. Pertinent factors considered in making the projection were the general population trends of Seattle; trends in enrollment in existing curricula; accessibility of proposed facilities; admission requirements of state colleges and universities; extent of available financial support; increasing demand for education; emphasis on occupational curriculums; and, trends in the number of graduates from Seattle's high schools. The procedures used in making these enrollment projections were also explained.
4. Decisions were made with regard to the number and location of the centers required. In arriving at these decisions, it was necessary for the planners to consider geographic characteristics of the city; population centers; patterns of land use; development of freeways and expressways; availability of public transportation; location of other community colleges; number and geographic distribution of high school graduates; projected enrollment; provision for equal educational opportunities; availability of land; and, coordination of the plan with that of other planning agencies.
5. The criteria for site selection were presented and sites were reviewed. A specific site was recommended in the north and south sections of the city and four sites were reviewed for the central portion of the city with a decided preference noted.

6. A comprehensive educational program was presented including transfer, general education, developmental education, adult education, and occupational education courses or programs.
7. The services required for the Seattle Community College program were presented in detail. The recommendations were outlined in relation to the proposed programs for the three campuses.
8. An analysis was made of the facilities being used by the adult and vocational program. Recommendations were made as to the feasibility of continued use of each of these six facilities.
9. Space needs were estimated for the three proposed centers. Separate projections were made for the transfer, general adult education, and occupational programs.
10. Cost estimates were made and a construction schedule was proposed.

McGuffey, C. W., et al. "Number and Location of Centers Required For the Long-Range Development of Seattle Community College," Long-Range Planning for Seattle Community College. Tallahassee, Florida: The Associated Consultants in Education, 1966, pp. 31-52.

Factors to be considered for the long-range development of Seattle Community College in determining the number and location of campuses.

1. Natural and man-made barriers hinder easy access to a campus.
2. A freeway system will enhance accessibility. A commuting time of 20-25 minutes for 75 to 90 per cent of the students is desirable.
3. Good public transportation and a rapid transit system will enhance accessibility.
4. Distribution of the population.
5. Location of other nearby community colleges.
6. Urban campuses located 4-5 miles apart is reasonable.
7. Distribution of high school graduates.
8. Distribution of future residential sites.
9. Location of campuses must be coordinated with city planning.
10. Control of course offerings should provide for adequate mixing of racial and ethnic groups.
11. No maximum enrollment figure should be fixed, but campuses with 5,000 FTE capacity appear desirable.

Pancoast, Lester, et al. The Planning of South Campus: Miami-Dade Jr. College, 1965. Miami: by authors, 1965.

1. The planning of Miami-Dade's second campus involved four types of planning:
   a. Urban-to place facilities within reach of a widespread metropolis. Near expressway intersection - accessible.

   b. Educational - "to define educational goals, to formulate and describe learning processes, and to produce a guide for planning and design." Parallel but complementary curricula; planned through faculty participation.
   c. Campus - to make it unique, complete and beautiful. Accommodates 3,000 autos in scattered lots. No campus traffic except service. Underground drainage, plazas.
   d. Architectural - to create "both buildings and spaces which belong to their time, place and purpose." Unification by mass and material. Long span construction of precast and exposed concrete. Variety of facility sizes and types.
2. The entire campus is conceived as a unified "city" of escape from the automobile. It is limited, yet expandible; formal, yet informal; remote, yet available; individualistic, yet connected.

"Planning". The Cost of A Schoolhouse, Educational Facilities Laboratories. May, 1960, pp. 44-62.

Although this reading was concerned primarily with secondary facilities, the essentials of long-range planning appear to have little difference whatever the educational level. The necessity of planning on a state-wide basis was stressed. Examples of large dollar savings due to early acquisition of appreciating land were given. Such savings are possible only when planning is performed sufficiently in advance.

Sources of planning ideas, assistance and data were suggested. They included: Faculty and staff, state agencies, consultants, planning commission, Chambers of Commerce, highway department, utility companies, developers, service clubs, bankers, lawyers and other professionals.

Population projection techniques were given a sketchy treatment. However, the concept of a facility life cycle was introduced and provides some useful theory. The cycle cited consisted of three phases:

1. Phase I - 0-20 years; period of least maintenance and expense.
2. Phase II - 20-30 years; repairs increase in frequency and seriousness.
3. Phase III - 30-plus years; costly major repairs to structure and systems, i.e., heating, plumbing, etc.

"Planning Factors," New Spaces for Learning (rev. ed.). Center for Architectural Research, School of Architecture, Reneselaer Polytechnic Institute. June 1966, pp. 27-32.

This section stresses the importance of the "Building Program (master plan)," which translates philosophy and goals into specific building requirements. The program should give the architect the following broad types of data:

1. A clear statement of the institution's educational philosophy and the relationship of the proposed facility to these goals and objectives.
2. A definitive statement of the purpose of specific buildings and their roles on the campus and in the community.
3. Brief descriptions of the functions of the facilities.

This publication was specifically concerned with designing facilities to utilize the instructional aids and media. It was pointed out that many architects have little experience with these newer educational aids. It therefore becomes imperative that the educator clearly and specifically communicates his requirements concerning facilities which will house these materials and devices. The need for "Flexibility" is stressed. "Flexibility" can be achieved in three basic ways:

1. Change the function of the space.
2. Change the size and shape of the space.
3. Move students from one space to another.

Space-Age Demands on State Supported Higher Education in Florida. Tallahassee, Florida: Florida Space Era Education Study, 1963.

This document is comprehensive as a long-range plan for the higher education needs of Florida. It is specifically slanted toward advance graduate level programs in the areas of science and technology. It is an attempt to provide a sophisticated, diversified higher education program for Florida citizens without duplicating costly effort. A professional staff, nationally recognized professional consultants, leaders in the science-technology fields, and a high-level citizens advisory committee prepared the document. Data were presented and projections made on the basis of materials prepared by the National Education Association Research Division, the Board of Control, the United States Office of Education, the United States Department of Commerce, the Florida State University, the American Council on Education, and the State of California.

"What to Probe Before You Build", College and University Business. XXXVIII (January, 1966).

"A major consideration in any planning is flexibility. The ability to change a plan without undue cost, to detour, and to keep moving towards a goal despite changes in condition, requirements, or environments has great value. New procedures, new technology, and new concepts of learning are changing the academic process. Consequently, master plans must be of sufficient flexibility to respond to these changes. Planning in detail too far ahead, making advanced commitments with inadequate data, and adopting a plan that is rigid and inflexible are some of the pitfalls to be avoided". (Harry Harmon - Chief, Facilities Planning, California State Colleges).

Van Zwoll, James A. "School Building Planning--First and Second Looks," The American School Board Journal, CL (May, 1965), 33-34.

Each building program undergoes a first look. This look is that which gives the call for action. In all too many cases this is the only look that is taken. The second look is equally important. This is the look that insures that proper planning will be undertaken.

Some of the elements in good planning include:

1. School Survey - A limited survey is one which is undertaken to determine a suitable site. This may lead to a good site selection, but not necessarily a good school. A comprehensive survey is one which undertakes to examine all aspects of the educational program including program, site, etc.
2. Design - The educational consultant is an expert in educational matters. The architect is an expert in building design. They each should stick to their own specialties.
3. Cooperative Planning - Cooperation in planning is both good and necessary. But unless those to assist are educated to the total educational program, they may recommend more of what the system already has., i.e. an obsolete school.
4. Obsolescence - Build not for today's methods, nor only for tomorrow's, but build with flexibility in mind so that the building can serve both today and tomorrow. "The criteria of the well-planned building is that it is designed so that it can be altered." p. 34.

Lack of a reflective second look in school building planning invites haphazard and nonfunctional planning and the risk of inadequate school buildings." p. 34.

Population Projections

Lins, L. J., Methodology of Enrollment Projections for Colleges and Universities. American Association of Collegiate Registrars and Admissions Officers, 1960. 67 pages.

This booklet is divided into four principal sections:

1. Enrollment Projection Techniques.
2. Short-Range Estimates of Enrollment.
3. Long-Range Projections of Enrollment.
4. Data Presentation.

Four projection techniques are presented:

1. Curvefitting.
2. Ratio.
3. Cohort-survival.
4. Correlation analysis.

In any particular situation one might want to use combinations of these techniques as they best suit the individual user's need. In a representative sampling across the United States, the author found the ratio method to be the most frequently used technique for both institutional and state projections.

McGuffey, C. W., et al. Long-Range Planning For Seattle Community College. Tallahassee: The Associated Consultants in Education, Inc., 1966. pp. 11-30.

Projection of Student Enrollment Potential.

1. Based on the following factors:
   - a. General population trends
   - b. Trends in existing curricula enrollments
   - c. Accessibility of facilities
   - d. Admission requirements of 4 yr. institutions
   - e. Extent of financial support for current operations
   - f. Increasing demands for education beyond high school
   - g. Degree of emphasis on occupational curricula
   - h. Trends in high school graduates.
2. Procedures in making enrollment projections:
   - a. Cohort survival technique
   - b. Index of ratio of high school graduates to twelfth grade enrollments
   - c. Projections of current vocational and adult education
   - d. Current enrollments of Seattle students in other junior colleges.
   - e. Experience of junior colleges in similar cities

McGuffey, C. W., et al. The Enrollment Potential of the Leon-Wakulla Community Junior College and the Lively Area Vocational Technical Center. Tallahassee, Florida: The Associated Consultants in Education, 1965.

This report is an effort to determine the enrollment potential through 1975 of the Leon-Wakulla Community Junior College and the Lively Area Vocational-Technical Center. The service area for the Junior College includes Leon and Wakulla counties (now also Gadsden County) with the Vocational-Technical Center serving Leon County. In determining the enrollment potential, the planners examined recent trends and future projections of population in the effected counties, birthrate trends, population distribution by age group, school enrollment trends at Lively Vocational Center, enrollments in institutions of higher learning, and the enrollment potential of each proposed institution.

Utilization of Existing Buildings

Avots, Ivar. "Space Utilization Studies," College and University Business, XXIV (March, 1958), 36-37.

The two basic functions of space utilization studies are:

1. Determine how much space is being used.
2. Determine how well it is being used.

Pennsylvania's Taylor Management Lab. identifies five problem areas to be considered prior to beginning the actual study; these are:

1. Forms needed - clear and simple; they permit summarization; forms should be maintained for each room.
2. Instruction needed - methods of form completion must be clearly communicated.
3. Equipment needed - proper equipment must be furnished to each survey team.
4. Progress control - the study should be divided into steps and reviewed after each step.
5. Summaries - all work is meaningless unless properly summarized for decision making.

A space utilization study does not solve space problems. It will give a better idea of space requirements and provide a guide for future planning.

A Manual for the Study of the Utilization of Instructional Space. Tallahassee, Florida: Office of the Board of Control, 1959.

This manual, adapted from a Manual for Studies of Space Utilization in colleges and universities by John Dale Russell and James I. Doi, is a guide for institutions in the State University System of Florida for developing and reporting instructional space utilization data. It deals with the amount of instructional space, the use of instructional space, and the way in which the use varies in Florida institutions. By using standard definitions and procedures, comparisons can be made with other states.

Constance, Clifford L. "Techniques of a Space-Utilization Survey," College and University, XXXII (Fall, 1956), 29-33

College presidents need to know how many more students their institutions can accommodate. This report deals with the attempt to answer this question at the University of Oregon. Their approach to the problem was organized into the collecting and tabular reporting of various kinds of information. The important definitions used were:

1. Space - space suitable for academic use including classroom, laboratories, offices, and varied service rooms.

2. Classrooms - those rooms intended primarily for seating classes.
3. Offices - those rooms listed as base for one or more faculty members and not primarily equipped for other use.
4. Student stations - classroom seating capacity.

Cornell, Francis G. "How To Manage Space," College and University Business, XXX (May, 1961), 61-65.

Management of space begins with a suitable inventory of existing space. The following data should be collected for each space in each building:

1. Building where located
2. Room number
3. Principal use
4. Floor area in square feet
5. Student-station capacity
6. Type of student stations
7. Academic department to which space is assigned
8. Schedule utilization

From information contained in the inventory, rates of utilization of the various spaces may be determined. If percentage of utilization is low then a study can be readily made to better match class sizes and capacities.

Scheduling, of course, affects space utilization, but there are several other external factors which also affect the possibility of optimum utilization:

1. Geographic location
2. Size of enrollment
3. Layout of campus facilities
4. Condition of facilities

Steps in the projection of long-time space requirements:

1. Classification of spaces by function
2. Determination of measure for each space category, e.g., student hours per week of instruction for classrooms
3. Determination of space norm or factor so as to convert measures into spaces required for each category
4. Combination of space measures and space factors to project total space required for each category.
5. Subtraction of existing space from total space needed to determine additional amount of space required.
6. Conversion of future space needs from square feet into building construction costs.

Doi, James I., and Kieth L. Scott. Normative Data on the Utilization of Instructional Space in Colleges and Universities. American Association of Collegiate Registrars and Admissions Officers, July 1960. pp. 24.

There were two purposes of this study:

1. To assess the status of space utilization studies in colleges and universities since 1956.
2. To follow up several of the suggestions regarding normative data on utilization of classrooms and teaching laboratories contained in the Manual for Studies of Space Utilization in Colleges and Universities.

Results of the survey:

1. More institutions made utilization studies during the period between 1956 and 1958 (457) than during the six year period between 1950 and 1956 (223).
2. Increase in the number of private institutions making utilization studies.
3. Increase in the number of people with various responsibility making utilization studies.
4. Widespread use of terms and measures suggested in the Manual on Space Utilization Studies for Colleges and Universities.

Data usable for development of norms were obtained for 217 colleges and universities. For both general classrooms and teaching laboratories data for four measures are shown in the report:

1. Room period use, expressed as the number of periods per week per room.
2. Student-station-use; average number of student hours/week/station.
3. Student-station-use during periods of room occupancy; percentage of student-stations used when rooms are actually occupied.
4. Relationship of student space to student occupancy; square feet of assignable floor space/100 hours of student occupancy/week.

Fuller, William S., "How to Keep Space Planning Down to Earth," College and University Business, XXXII (April, 1962), 63-66.

The author defines two terms:

1. Space allocation - the distribution of space.
2. Space utilization - the study of the use made of allocated space.

The data indicate that:

1. Schools do not project "long range" development beyond a five-year period.
2. Little national data on utilization is available.
3. Institutions should:
    a. Have details of existing space and allocations.
    b. Make annual utilization studies.
    c. Use institutional research to improve facilities use.
    d. Have a flexible campus plan.

The author found that of 100 schools visited, few had meaningful facilities data. Such data should be developed and updated. There are several types of forms already in existance. Reduced scale line drawings are also useful. Use and capacity are key considerations. Doi-Scott norms indicate a 50 per cent use of capacity. A campus plan, which enunciates land use, should be drafted but should remain flexible and should mesh consistantly with the master plan.

Jamrich, John X. "Improving Utilization," To Build or Not to Build. New York: Educational Facility Labs, 1962. pp. 34-38.

Factors in low use of facilities:

1. Uneven distribution of classes by days and hours.
2. Length of the week.
3. The school year.
4. Division of curriculum units
5. Class occupancy equivalent to credits
6. Laboratory space - (necessary for non-majors?)
7. Inflexible classrooms (i.e.: rigidity, too large in size)
8. Proliferation of courses
9. Proprietary attitudes of certain departments
10. Self-pride which demands "new buildings"

Russell, John Dale. "Utilization of Building Space in Institutions of Higher Education," College and University, XXXII (Summer, 1957), 481-493.

Two compelling reasons for making space utilization studies:

1. Such knowledge is a condition of good management.
2. The prospect of large enrollment increases during the next 20 years--much of this increase will have to be met with better utilization of available space.

Space utilization data are not solutions to problems. Such data form the basis from which possible solutions can be derived.

Russell (and Doi) measures space utilization on two basic measures:

1. Room-period utilization: the number of periods per week that instructional rooms are used.
2. Student-station utilization: space required by one student during one hour of class or laboratory work.

Space information was collected on 101 institutions and rank order in the preparation of norms.

Russell, John Dale, and Doi, James I. Manual for Studies of Space Utilization in Colleges and Universities. Ohio University, Athens, Ohio: A.A.C.R.A.O., 1957.

This study was undertaken by the authors at the request of an A.A.C.R.A.O. Committee. It can be divided into four major sections: background and definitions concerning space utilization studies, forms and procedures for data collection, forms for data interpretation and analysis, and finally, normative data developed by the authors through a survey of 101 institutions of higher learning.

The Utilization of Instructional Space in the State University System of Florida. Tallahassee, Florida; The Board of Control, 1962.

This is a study of the amount of instructional space available and its use during the fall 1962 trimester at the University of Florida, the Florida State University, the University of South Florida, and the Florida Agricultural and Mechanical University. General classroom, seminar room, teaching laboratory, and teaching auditorium space and usage were studied. This involved 687,743 square feet of floor space and 34,827 student stations in 810 rooms. Some of the pertinent general findings and conclusions of this study are as follows:

1. The average usage of general classrooms ranged from 20.4 periods per week at Florida A & M to 28.2 periods per week at Florida State.
2. The best use of instructional space occured between 9:00 a.m. and 12:00 noon. Approximately 44 per cent of the instructional space was used during this time.
3. Rooms were not crowded as only 62 per cent of the student spaces were in use while the rooms were occupied.
4. Better use needs to be made of instructional space by scheduling more afternoon and evening classes; by scheduling more Tuesday and Thursday classes; by matching class sizes to room capacity; by more uniform use of buildings; by converting more of other types of space into instructional units; and, by eliminating classes with enrollments below a reasonable number.
5. It will be possible to accomodate greater numbers of students at the present time (the time of this report) but based on enrollment projections, more building space will be needed.

Zanfino, Frank J. "How Many Students Can Your College Accomodate?" Here's a Simple Formula To Help You Find Out," College and University Business, XXXIV (May, 1963), 49-52.

This article presents a simplified approach for determining optimum utilization of classrooms, both for present plant and for future facilities. After inventorying the number of classrooms and the number of student stations per classroom, the following procedures are used in making the calculations:

1. Total number of clock hours the room is available per week is multiplied by pre-determined optimum per cent of utilization, thus giving the net clock hours per week that the room is available.
2. Next the ratio of clock hours to credit hours is determined so as to reduce clock hours of classroom instruction to student credit hours.
3. The final step is to multiply the number of student stations per room by the clock hours converted to credit hours so as to give the number of student credit hours that can be provided in each classroom. Then by dividing the product by the average full-time credit hour load per student the total student classroom accommodations is determined.

Estimating Space Needs

Associated Consultants in Education, Inc. The Florida Study of Higher Education Facilities: Needs for Undergraduate Academic Space. Tallahassee, Florida: Florida State Department of Education.

This study was conducted by the Associated Consultants in Education for the State Commission of the Higher Education Facilities Act of 1963 to help that Commission implement the Florida State Plan for the Higher Education Facilities Program. Data were gathered to help evaluate applications for funds to construct academic facilities; an assessment was made of the academic facilities currently available; and, a projection of academic facility needs was made. A total of fifty-four institutions including those of the State University System, the State Community Junior Colleges, and sixteen non-tax supported colleges and universities participated in the study.

Baker, James A. and Alfred W. Baxter, Jr. "Space Formula Can Help Planners Determine Optimum Number and Sizes of Classrooms," College and University Business, XXXIII (July, 1962), 27-31.

Using operations research (the application of a body of mathematical techniques and probability calculus) the authors have devised a tool (formula) for increasing classroom efficiency.

"Four steps are necessary to apply operations research method to problems of determining the optimum size and distribution of classrooms:"

1. Specification in detail of the characteristics or proposed characteristics of the institution.
2. Collection of historical data.
3. Reduction of data.
4. Insertion of data into the mathematical model.

"The model provides a method of determining the exchange value of inconvenience and dollars." It is a rational way "of optimizing plant for any expenditure and for minimizing the capital expenditure needed to build class or seminar room facilities for any describable academic class schedule."

"Building", The Cost of A Schoolhouse. New York: Educational Facilities Laboratories, 1960. pp. 62-113.

Quantity x unit cost = cost of building.

1. Quantity is based on educational decisions.
2. Unit costs are variable. Results of a 1959 survey.
    a. Cost of gross building area = $15.99 per square foot
        1. Interior partitions - 15%
        2. Exterior walls - 12%
        3. Heating and ventilating - 12%
    b. Varies from $13.70 in South to $17.84 in Northeast.
    c. Classroom space per pupil, 26 to 38 square feet.
    d. Auxiliary area per pupil, 34.5 square feet.
    e. Service area per pupil, 15 to 45 square feet.
    f. Total area per pupil, 75 to 115 square feet.
3. "Don't expect the architect to make the educational decisions necessary before planning the buildings." This is the educator's responsibility.
4. The remainder of the chapter is an excellent detailed technical review of construction elements..

Bursch, Charles and Ruel L. Taylor. "Master Plans," College and University Business, IX (November, 1950), 27-31.

The master plan charting the growth of a campus must be developed before the site is purchased or the first building layout is sketched. This article explains how the Department of Education of California determines the state's classroom needs.

A formula on room requirements and standards was developed to determine the number of instructional rooms required by each state campus to accommodate its maximum enrollment policy.

"The formula required a determination of average class size, the peak enrollment in each subject, the number of hours per week rooms are available, and the number of hours per week classrooms and laboratories are used for each 15 units of credit earned in each subject. The formula, based on a 40 hour week, with 70% utilization for general classrooms, and 45% utilization for special rooms (Laboratories), was considered to be saturation use."

The formula:

$$\frac{\text{FTE}}{\text{Average class size for subject}} \times \frac{\text{Number of class hrs. per week for 15 credit units in subject}}{\text{Room satuaration hours per week for subject}} = \text{Number of Rooms Needed For That Instructional Division}$$

"College Buildings: Space Analysis," Progressive Architecture, XXXIII (February 1952), 61-79.

Most of the information in this article is taken from a survey, "Report on a Development Plan and a Construction Program" regarding Orange Coast College by Robert E. Alexander, architect.

The method of calculating ultimate space requirements can be broken into three steps:

1. The estimated enrollment is multiplied by the number of hours the class meets each week.
2. The number of sections per class is multiplied by the number of class hours per week.
3. No. of classroom hours per week is then divided by the hours of possible multiple-use occupancy (say 24.5). This yields the number of classrooms needed for each subject.

There follows brief technical discussions of specialized problems faced in the planning and construction of Orange Coast Junior College. First, the structural-acoustics problems involved in the technology building activity. Second, given the existing fenestration scheme the rationale is outlined for selecting lighting and color-scheme that was employed in the same building.

Cosand, Joseph P. and Tirrell, John E. "Flying a College on a Computer," Junior College Journal, XXXV (September, 1964), pp. 5-8.

The following technique was used to project class schedules and classroom-student station utilizations for planned college so as to determine faculty and physical facility needs:

Computer used to run simulated class schedules for all possible combinations so as to arrive at most efficient and economical use of faculty and plant.

Certain assumptions and information were fed into "the monster" as input data for its programing of the institution's future operations as follows:

1. Enrollment - 4500 students
2. Program - 60% college transfer; 40% technical programs
3. Space Utilization - 80% classrooms; 60% laboratories

Computerized results were as follows:

1. Classroom sizes - 24, 35, 50 student stations
2. Lecture Hall sizes - 100, 150, 320 student stations
3. Room utilizations - 82% classrooms; 66% laboratories
4. Seat utilizations - 88 per cent

Savings produced by use of this technique: Approximately 100,000 square feet of floor space over original estimates.

Davis, Gerald. "Building Programmers Act as Translators," College and University Business, XLI (October, 1966), pp. 84-86.

The building programmer is a specialized management consultant who finds out what the owner actually needs, and translates this into the language of the architect. Their purpose is to improve utilization and investments.

The person acting in this capacity should be trained as an architect, yet also trained and experienced in management and furthermore, with qualifications in relevant research techniques.

How the programmer turns ideas into action:

1. Estimates the general parameters of the problem; define the scope of the developmental plan.
2. Use critical path and pert techniques to specify what decisions must be made, what information will be required to make them, what criteria would be relevant to them.
3. Estimate in detail the enrollment and staff parameters for each field of specialization.
4. Identify the characteristics and physical requirements for enclosed and open space that are set by each programmed activity.
5. Inventory existing space and evaluate it on terms of requirements.
6. Develop a statistical program description and a physical sketch plan for a variety of options of size, staffing, etc., showing the amounts of building space needed in each. He would use computer simulation to test the financial and physical consequences of the options. The output of this work should be a range of alternative master development plans, with their corresponding capital plan and budgets.
7. Provide the architect information for individual buildings so that he can design structures.
8. Provide rapid and continuous evaluation.

"Flying A College On the Computer." St. Louis: The Junior College District, 1964. (Mimeographed)

1. St. Louis has used the computer to schedule its program before plans were made for the college.
2. The rationale: an increase in utilization would mean a decrease in financial outlay for buildings.
3. Basis for the program:
   - a. Robert Holz (MIT) GASP computer scheduling program.
   - b. Sixty percent academic, 40 per cent technical, 4500 FTE
   - c. Eighty per cent clssroom use, 60 per cent laboratory use on a 45 hour week with varying classroom sizes.
4. Twenty-seven computer runs gave these results:
   - a. Sixty-two fewer rooms than average: a savings of $2,500,000.
   - b. Room utilization of 82 per cent in classrooms, 66 per cent in laboratories.
   - c. No. of faculty at a ratio of 26:1.
   - d. Seat utilization of 60 per cent including low-use rooms.
5. Issues raised:
   - a. Is it realistic?
   - b. Faculty reactions?
   - c. What about "human element" problem?

Fuller, William S., and Rork, John B. "Classroom Space Per Student: Here's How to Figure It," College and University Business, XXXI (September, 1961), 43-47.

The authors point out, "that the number of square feet per student-station may be determined only after the function, the size, and the shape of the room have been established." To substantiate this fact, the normative data from six midwestern statewide studies are presented to show the variance in square feet per student station. Hypothetical classrooms are also pictured showing how the size and shape of a room effects its student station size.

A public junior college in Kansas has more than 33 square feet per student-station while the University of Wisconsin has slightly less than 12 square feet per student-station. A.C. Lambert recommends 6.5 square feet per student-station in that portion of the classroom where seats are normally placed. The type seating (furniture) in a classroom will greatly affect the square feet standards.

At the college level, the lecture method of teaching is widely used. More students can be seated in this type of class which explains the norm of 16 square feet which has been widely accepted. The larger the institution, the smaller the average number of square feet per student station. The university, the college, and the junior college would fit that pattern and fall into that order with the junior college having the largest student station.

The larger the classroom the greater the proportion of the total area utilized for student seating. The size of the classroom then will also effect the square feet per student-station within the room. The shape and arrangement of the room is another factor in considering the student-station area.

In figuring the size of the student station, if the total assignable area in each classroom is used as a base, the larger the classroom the less square feet per student-station; if only the seating area within the classroom is used as a base, the square feet per student-station may remain the same in any size classroom.

If the academic facility is to be well-planned, it is necessary to keep all these factors in mind and use the "standard","norm", or "rule of thumb" which best fits the particular situation.

Fuller, William S., and Rork, John B. "College Classroom Planning," Higher Education, XVII (April, 1961), 13-14.

1. Two studies were conducted by staff members of the Division of Higher Education, Office of Education to determine normative data on student-station size. Theyfirst studied student-station size by considering the condition of the buildings.
2. Each study points to the fact that normative data may be misleading. The norms can be skewed by factors of classroom function, shape, size, or condition.
3. By analyzing these other factors, the individual institution can use nationwide standards of student-station size to good advantage.
4. Each institution should develop its own guidelines with the help of normative data from these and other Office of Education studies.
5. Results of the first study with 136 North Central States institutions reporting were as follows:

Average room size	722.7 square feet
Average student-station	15.6 square feet
Average class size	26.7 square feet
Average number of stations per classroom	46.3 square feet

   These figures were also broken down by control, type, and location (in which state) of the institution.
6. With 111 institutions reporting on a total of 1,299 buildings by condition of the building, the second study determined the average area per student-station as 17.3 square feet.

Graham, Marshall A. "Space Formula Technic Aids Classroom Planning," *College and University Business*, XXX (May, 1961), pp. 68-70.

Classroom capacity for student-stations equipped with tablet-arm chairs can be calculated by means of a technique which bases the capacity of a room upon its linear dimensions.

In setting up the formula certain assumptions must be made:

1. Center-to-center distance between chairs along a horizontal row is two feet.
2. Front to rear distance from one seat to another in a vertical row is three feet two inches.
3. Each room should have two front to back aisles with a width of three feet each.
4. Rooms containing up to six horizontal rows should allow seven feet in front of first row, while rooms with more than six rows should allow at least eight feet.
5. Students should not pass more than four seats to reach an aisle.
6. Single loaded aisles should be at least three feet wide, while double loaded ones should provide at least four feet.
7. Rooms with more than ten horizontal rows should have three feet wide aisle in back of room.

The capacity of any given room may then be found by multiplying the possible number of rows, front to rear, by the number of seats which are linearly possible in each horizontal row.

Knezevich, S. J. "When are Schools Overcrowded?" *American School Board Journal*, (January, 1957), pp. 46-48.

The author makes the following points:

1. Prior to constructing a new facility the term overcrowded must be defined precisely, i.e., desirable conditions must be calculated and planned into the new facility.
2. Determining plant capacity is not simply determining how many the plant will hold but rather how many it will hold considering the nature and function of the program.
3. Capacity considerations must be coordinated each time a curriculum change is being planned.
4. Overcrowding has implications other than the harm it may do to the learning process:
    a. Health
    b. Safety
    c. Sanitation
    d. Lighting
    e. Acoustics

5. A student station standard must be adopted if overcrowded situations are to be specifically located.
6. Lengthening instructional periods and other scheduling techniques may alleviate some overcrowding.

While the article's contents were directed to the primary and secondary school administrator, the points which have been extracted hold true for all levels of education.

Lambert, A. C. "Don't Plan Too Many Small Classrooms", College and University Business, XVI (April, 1954), 47-48.

1. Some small classrooms are needed
    a. Young graduate departments.
    b. Experimental curriculums.
    c. Needs and patterns differ as to size of the institution.
    d. Educational arguments for small classes may be sound but cost cannot be ignored.
2. Some disadvantages
    a. Aisles space usually inadequate.
    b. Small rooms increase scheduling problems.
    c. Invites proliferation of courses.
    d. Don't want too many large rooms either.
3. The "right size"
    a. No one really knows what the "right size" is.
    b. Medium and large size classrooms add:
        1. Flexibility
        2. Reduces necessity for overnumerous faculty members
        3. Permits outstanding teachers to contact more students
        4. Reduces unit cost of instruction
        5. Reduces the proportionate amount of total floor area that has to be allocated to teacher space.
        6. Reduces cost for walls and partitions.
    c. Current idea seems to be to use several sizes although no one knows how many of each size to include.

Patterson, Dow. "Determining Instructional Space Needs in Junior Colleges," The American School Board Journal, CXLI (November, 1960), 29-32.

Plant space needs depend on the following factors:

1. School enrollment potential and projections.
2. Square footage necessary per student station to carry on the instructional program.
3. Size of classes in the various instructional areas
4. Number of credit hours per semester considered as a full-time student load.
5. Percentage of total credits earned by all students that are earned in each individual subject.

6. Percentage of full-time use of teaching stations to be considered as saturation use.
7. Method of determining the number of teaching stations for subject needs.
8. Established teacher needs for estimated enrollments.

The primary unit for determining plant needs is the student station; secondary is the teaching station. Flexibility in construction is imperative. Two formulas are given--one for new colleges and another for expanding older efforts. Both are rather neat and probably as effective as any; however, the author admits that there are several subjective criteria to consider and all answers must be tempered by "administrative judgement."

Portugal, E. J. A Preliminary Report on the Application of Space Adequacy Survey-College at 17 Selected California Junior Colleges. Berkeley: University of California, 1961.

1. "A device or instrument by which a junior college administrator may determine how many teaching stations he will require for a specific enrollment for a given educational program." (5) Originally developed by Bursch and Gibson.
2. Based on the following: courses offered, relative emphasis of program, unit for comparison, average or ideal class size, classroom or lab course, room utilization and available class periods per day.
3. Size is based on "GRAND TOTAL OF STUDENT HOURS PER WEEK": the sum of all hours produced in one week between the hours of 8 a.m. and 5 p.m. This is derived by multiplying the number of students by the number of hours attended. It is considered a more valid measure of relative size than any other means available.
4. Enrollment is based on FTE students.
5. It is not a utilization study, but a planning technique.

Selecting and Planning Educational Building Sites

"Architecture Gives Campus Unity of a Single Building." College and University Business, XLII (February, 1967), 72-75.

An outstanding example of modern historical development and the effect of cultural factors on the design of a senior college is the single architectural concept embodied in Southeastern Massachusetts Technological Institute, a "commuter college."

The design, considered capable of unified growth, has three principal elements: a direct and very simple site plan, an over-all structural grid, and a series of strongly modeled elevations.

A ring road leads to parking which is screened from the campus by earth mounds and plantings. The campus terraces down from the entrance and widens out to a lake vista.

A pattern of evenly spaced column clusters, connected by walls to form hollow, polygonal piers, provides a design that continues through the campus. The piers support alternating projecting elements at the top of the buildings, and the ground floor is always deeply recessed. The real function of all the projections and recessions is to create architectural variety and interest.

A major innovation is the off-setting of the buildings every six bays, with corridors connected diagonally and an elaborate series of balconies in the diagonal links to provide lounges and meeting places as well as visual effect.

Outdoor terraces, benches, and steps are heavily utilized to supplement the function of the indoor balconies.

The total cost of $26 per square foot includes built-ins and sitework.

Beynon, John, "Campus Planning: Review and Preview", Report From the School Laboratory, School of Education, Stanford University, Stanford: Educational Facilities Lab, Inc., 1967.

1. Urban schools for urban places.
2. Rural urbanity
3. Who plans
4. Variety and life
5. Expansion and size
6. Interdisciplinary relationships
7. Community relations
8. The auto and parking
9. Conclusion
    a. Little is being done to enrich the environment for the students
    b. Little is being done to design the professor's niche
    c. Every campus needs a tailored design
    d. Campuses will increasingly take on an urban flavor, be it located in the city, small town, or in relative isolation

Brown, Ted. "Urban Renewal Expands Atlanta Campus", College and University Business, XLI (August, 1966), 54-55.

Georgia State College, located in the heart of downtown Atlanta, began with one garage building in 1946 and immediately began the slow process of land acquisition in order to be in a position to meet future needs for physical facilities.

As an example of the various methods used, a plot of land was purchased for exchange purposes only. This plot was traded to the City of Atlanta in exchange for a plot owned by the City. The City had planned a fire signal station on the original plot, which was contiguous to the original college property, but was persuaded to build on the exchanged plot instead.

Other plots close to the original garage plot were purchased as they became available. A slum area to the south of the college offered a problem. The City wanted to remove it. The college wanted to remove it and get the land and at the same time make a campus that would be safe and attractive. A down-town cultural center had been discussed for a number of years.

These ideas were combined into an urban renewal project that successfully converted the area to college use, provided for a downtown cultural center, and removed the slums. The cost was shared by the city and the federal government.

Results of the project were so favorable to the college that a second urban renewal project involving land to the east of the college has been started.

Crawford, Edwin. "Universities Grow Large, But Keep Education Student-sized," College and University Business, XLI (December, 1966), 41-44.

Small college concepts can personalize big universities. This coast-to-coast report tells how it can be done.

The growing tendency of large universities to divide students into small colleges will definitely influence campus planning and facilities construction. The promise of such efforts is typified in an early assessment of Michigan State University's new residential Justin S. Morrill College. The Dean hailed what he found to be a "definitely emerging sense of community, of common enterprise and esprit" on the campus. The college is a four year liberal arts institution with its own faculty, curriculum and degrees. It has administrative and budgetary autonomy, though most of its teachers hold joint appointments with other MSU colleges.

Rutgers Universities are planning to build three colleges in small units on a 540 acre portion of the campus. The college dean said "the building has been designed to facilitate these meetings (between faculty and students), while at the same time allowing students and staff to be separated when they want. We wish to attack anonymity without destroying privacy." What this means in terms of facilities will challenge the educational planner and architect.

The basic purposes of the cluster college concept is to give students a sense of identity and to "provide a climate for maturity - emotional and intellectual." Thus other techniques and methods such as, emphasis on independent study, a variety of classroom sizes, new teaching media and methods, which emphasize student-centered curriculums, will likewise affect the school plant of thr future (which is being built today).

Ferendino, Andrew J. "Site Planning and Development--A Case Study of Miami-Dade Junior College," The Florida Architect, Vol. 14 (June, 1964), 13 ff.

Creation of a college campus on portions of an old naval air field presented Miami-Dade with an opportunity for immediate occupancy of an instant physical plant at a far greater initial enrollment than originally anticipated.

This opportunity, however, also brought problems of site development, integration of new buildings with old, and of defining a new functional identity from the bleakness of a ghost facility.

Methods used by the site planner and architects to create an aesthetically pleasing academic atmosphere are as follows:

1. Establish buffer zones to screen off and out undesirable sights and sounds, e.g., a botanical garden at the campus entrance to filter out some of the sounds of a heavily traveled adjacent highway; and the location of the athletic field at such a point so as to shield the view of a nearby industrial park.
2. Separation of the academic and student activity areas by means of a multi-purpose court or 'prado.'
3. Removal of vast areas of concrete runways after temporary use as parking lots.

Herrick, John H. "Trends in School Building: The Site." The School Executive, LXXV (August, 1956), 72-74.

The sole purpose of having a school site is to promote a good school program. While the emphasis on program adequacy is properly a major one, attention must also be given to health and safety; costs of acquisition, development, and maintenance; ease of reaching a site; and the nature of the neighborhood in which it is located.

Before judging whether an existing or proposed site is adequate for the school program, a careful look at the school program itself is required. The future school program, rather than the current one, must be given the greater weight in establishing the size of the site and in forming a long-range plan for its development.

Public schools and public recreation programs are paid for by the same taxpayers, and the school authorities share with other public officials a responsibility for avoiding needless duplication.

The only satisfactory answer to the question of size must be sought through a trial layout of the needed facilities on a proposed site, and this preferably with the assistance of a competent architect or landscape architect.

It is essential in site consideration not to overlook the probability of future program expansion, but the emphasis on program expansion and adequacy should not obscure the need for full attention to health and safety in the selection and development of the site.

Two frequent errors with respect to site cost are: (1) to attach too great importance to the purchase price of a piece of land which will represent but a small fraction of the total cost of the project; and, (2) to fail to estimate the effect of topography and subsoil conditions on costs.

Interstate School Building Service, "The Selection and Development of School Sites," Economies in School Construction, Nashville, Tennessee. George Peabody College for Teachers, 1962, 22-24.

The site is a functional part of the school plant and should be considered as such when selecting and developing.

There is a great deal of variation in sites as regards to purchase price and developmental costs. Therefore, in order to have the best site for the most reasonable figure, one should consider the following factors:

1. Use professional help in selection and development.
2. Purchase site well in advance of need.
3. Purchase a large enough site to take care of expansion.
4. Be cautious of gifts of land.
5. Locate site in the center of population, in high density area.
6. Consider the availability of utility services. It is best to have them already available.
7. Study and consider all costs: initial, developmental, and maintenance.
8. Obtain appraisals and attempt to make outright purchase, but do not be wary of using condemation.
9. Choose a site which will contribute to economy of construction and development through favorable physical characteristics.

McGuffey, C. W. Considerations in Selecting and Planning the Community Junior College Site." Florida Architect, XIV (June, 1964), 11 ff.

The required Florida campus development plan is conceived as a diagrammatic layout showing functional relationships, land utilization, arrangements for traffic flow, relative placement of buildings, and landscaping. The purpose of the campus plan is to project in graphic form the long range need for site, buildings, and other physical facilities required to serve the purposes and programs of a particular institution.

The plan provides a logical and orderly pattern for growth and expansion, makes change and expansion of facilities possible without impairing on-going programs, permits long range development in progressive stages, allows construction of facilities that will meet program needs at any given phase of development, makes possible the development of the campus as needs and financing occur, and overcomes limitations imposed by shortsightedness.

Information must be available on current and projected needs for educational services. Ten statements of principles regarding functional relationships and requirements are quoted from the Florida Department of Education publication, "Master-Planning Florida's Community Junior Colleges".

Traffic patterns and flow should be considered with the student and building service needs foremost.

The dynamic nature of the junior college educational program requires provision for orderly expansion and development.

Continuous appraisal and evaluation of the plan is necessary.

McGuffey, C. W. "Review of Sites Proposed," et.al., Long Range Planning for Seattle Community College. Tallahassee: Associated Consultants in Education, 1966. 53-71.

This portion of the Seattle study established several criteria for site selection:

1. Location: in the center of the area to be served, ample zoning, access to business and industry.
2. Availability: can the site be purchased with a minimum of condemnation proceedings?
3. Environment: this was the consultants' objection to the site located in the airport landing pattern.
4. Accessibility: not only availability of transportation routes, but the appropriate commuting time (20-25 minutes for this study).
5. Physical characteristics: 60 acres of land as a minimum, regular shape, topography, elevation, weather conditions, soil characteristics.
6. Utilities: availability of public service
7. Costs

These criteria, with specific data for each site, were arranged on an "Evaluation Summary of Alternate Sites." Each site was then rated according to the criteria previously listed.

McGuffey, C. W. et.al. A Site Study for Lake Michigan College. Tallahassee, Florida: Associated Consultants in Education, 1965.

1. A detailed study of a variety of factors affecting the location of a small community college in Michigan. Looks at existing site, existing facilities and alternative sites.
2. Based on the following criteria: location, availability, environment, accessibility, physical characteristics, public services, community services, political implications, and costs. Each site is evaluated by these factors.

3. Study shows existing site to be inadequate in size, delay in possible completion, and unsuited for purposes; two alternatives are given which are satisfactory.
4. The proposed acquisition of buildings in judged on the following criteria: appropriate to purposes, economy, environmental factors, expansion, safety, functionally related, comparative cost to new buildings.
5. Important factors in decision: interstate system of highways, immediate surroundings, physical features, costs, political situation.

Miller, Richard A. "Harvard's Course in Continuity," Architectural Forum, No. 3 (September, 1960), 95-105.

1. "A university is a cultural center within a city, and it should set an example of good planning and good design." (95, Sert)
2. Harvard established its first planning office in 1958
3. Three alternatives to expensive land acquisition:
   a. Build more compactly
   b. Grow in height
   c. Use existing space more efficiently
4. "A good physical environment should provide a balance between open landscaped spaces and built-up areas . . . . It should be dignified, serene, and harmonious." (98, Sert)
5. Harvard does this by a counter point of open spaces:
   a. Formal space is broken into large and small courts, contained by buildings, and interwoven with a crisscross of paths.
   b. Informal space is wide-open but loosely enclosed and joined by a "cow-path" street pattern.
   c. The spaces generally flow continuously together, always leading the eye onward to a new space, and to new character.
6. It is tied together by sound construction, good materials, detailing, textures, and the patina of New England weather.

Morisseau, James J. "Campus." Bricks and Mortarboards. New York: Educational Facilities Laboratories, (n.d.), 133-154.

Some interesting points:

1. The contribution of a campus to institutional purposes is more often the result of planning than design of individual buildings. Most institutions are not thinking far enough into the future.
2. "Zoning" of a campus raises debatable questions. Some campuses are going to integrated activities and facilities. The informal plans have survived better than the formal.
3. The trend is to center the campus on lecture hall. Some planners are providing space by function rather than by disciplines. Also, they create a variety of

spaces rather than convertibility.

4. Expansion can take four forms:
    a. Increase in existing facilities
    b. Duplication through additional graduate or prof. schools
    c. Duplication through new campuses
    d. Creation of an entirely new campus

Patterson, Franklin and Longsworth, Charles R. "Hampshire College Site: Description and Analysis," The Making of a College. Cambridge, Massachusetts: The M.I.T. Press, 1966, 328-342.

The following criteria were used to judge best site for location of this new institution:

1. Accessibility to sponsoring institutions Smith, Mount Holyoke, Amherst, University of Massachusetts.
2. Adjacency to educational, cultural, and recreational resources of Connecticut River Valley.
3. Suitability of property.
4. Availability of utilities.
5. Educational program space requirements
6. Future expansion possibilities

Riker, Harold C. "Sites, Sizes, and Shapes," Planning Functional College Housing. New York: Teachers College, Studies in Education, n.d., 81-122.

In selecting the site for a residence hall, Riker lists several factors which should be taken into consideration in the long-range plans:

1. The general campus plan
2. Building relationships
3. Architectural style of existing buildings
4. Land-use requirements
5. Setting of the hall

In a study of 42 colleges and universities (conducted 1951-54) across the U.S., Riker discovered that the median size of women's halls was 150 (with a low of 60 and a high of 1,059); the median for men's halls was 155 (with a low of 28 and a high of 1,179).

Generally speaking, residence hall floor plans fall into three major categories:

1. Verticle or section type--this multientry type floor plan has been seldom used since 1940.
2. Horizontal or corridor type--by far the most common type of floor plan. On each floor a corridor extends the length of the building with room on either side.
3. Apartment-like type--includes a kitchenette, 2 or 3 bedrooms and study room.

Rollins, Charles, Brubaker, C. William, and Frizzell, William R. "Facilities Plan For A Changing Junior College Program," _Florida Architect_, XIV (June, 1964), 17 ff.

The importance of preliminary discussions between architect and educators cannot be overemphasized, for if the architect is to clothe the philosophy and ideals of an institution in steel and concrete, he must have a clear understanding of the philosophical bone structure of that institution.

The design sought at Edison Junior College was to be not a glorified secondary school or a semi-university; not a sprawling finger-type building but a compact, flexible building tailored to southwest Florida's subtropical climate and rainy season. The buildings were to be compact, two-story, and close together so that advantage could be taken of air-conditioning.

It was decided to make the campus an experiment in organic design. Space and facilities recommendations were made on the basis of population growth estimates to provide growth from opportunity to opportunity in a series of adaptations.

The building program was developed in two phases with a maximum amount of uncommitted space--space designed for temporary purposes only.

III

PLANNING THE INDIVIDUAL SCHOOL

Educational Specifications

Cramer, H. L. and McGuffey, C. W. "Content", Educational Facilities Planning, Florida State Department of Education: Tallahassee, Florida, 1963. pp. 19.

1. Purpose of education specifications.
    a. Impetus for developing instructional program.
    b. Bases for determining the number and types of spaces needed.
    c. Architect provided information for design purposes.
2. Content of edspecs should include a description of the program and activities.
    a. Description of the spaces in the plant and relate to functions.
    b. Furniture and equipment for each area detailed in regard to number, size, and function.
    c. Special utilities needed.
    d. Information on environmental requirements, service drives, and parking areas.
3. How specific?
    a. Complete enough to enable architect to prepare an acceptable solution.
    b. Not so specific so as to restrict the architect in using his talents and training. (Floor plans and minimum sq. ft. requirements usually not placed in edspecs)
    c. Schematic drawing such as circle diagrams may be used to show the relationship of spaces.

Educational Specifications for Polk Junior College. Bartow: Polk Junior College, 1965.

This is a document developed for use as a guideline in the future development of public junior colleges in the state of Florida. It contains an organizational chart, a format for facilities planning, and a series of chapters showing "what is to take place in each of the spaces to be built and used on the new campus." The material in each of these chapters shows a great deal of work, and is worthwhile for anyone contemplating a new junior college.

Gardner, Dwayne E. "Do's and Don'ts of Educational Specifications," American School Board Journal, CXLVIII (June, 1964), 17-19.

Educational specifications may be defined as a written communication from the owner or the educator to the design professions, particularly the architect, describing the educational activities that the school plant should accommodate, present and future."

Educational specifications are neither mere statements of the instructional program nor building specifications. They are a connecting link between the two. "A good set of educational specifications describes briefly and clearly the activities to be housed, nature of the people involved, spatial relationships of the school plant to site, interrelationships of one instructional area to another and to the noninstructional areas, equipment and the furniture to be housed, and any special provisions which deal primarily with environmental conditions of the school plant."

Characteristics of good educational specifications:

1. State the program needs and leave the design methods to the architect.
2. Be clear and concise.
3. Stimulate creative thinking and cooperative effort.
4. Completely cover the scope of immediate and future educational needs, to assure the planning of adaptable and functional facilities.
5. Be based on a fully defined curriculum.
6. Define forseeable needs and suggest educational solutions to the design profession.
7. Omit rigid prescription.
8. Be stated in the form of educational problems requiring solution by the architect.
9. Be developed by members of the educational profession.

Gardner, Dwayne E. "Prescribing Educational Specifications," Audio-Visual Instruction, X (February, 1965), 98-100.

"The emphasis in the edspecs should be upon how teaching will take place." The task is similar to writing a job description.

Characteristics of educational specifications:

1. Describe the total school program and the facilities needed in the school program.
2. Fit a predetermined instructional program.
3. Stimulate creative thinking and cooperative effort.
4. Provide functional facilities with favorable climate for intelligent communication.
5. Be free of architecturally rigid prescription and leave the design methods to the architect.

The following information should be included in the specifics:

1. Philosophy and objectives
2. Activities to be housed
3. Persons to be accommodated
4. Space requirements
5. Spatial relationships
6. Equipment to be housed
7. Special Environmental provisions

Educational specifications are of no use if they are not put to work. Therefore, the style and format must be suitable to the story being told.

The architect should serve as an observer and consultant during the development of educational specifications.

Knezevich, S. J. "Curriculum and the School Plant," Educational Leadership, (May, 1953). 495.

Since this article is fourteen years old, much of the specific data and certain of the examples are now outdated. However, many worthwhile planning principles permeate the author's discussion. Among them are included the following:

1. The plant is a physical expression of the educational philosophy of the community.
2. Current errors will haunt educators for decades to come.
3. Philosophy has shifted from the planning being protective to its being functional.
4. The plant and curriculum are interrelated - one is a function of the others.
5. Prior to facility design, curriculum scope, content and methods must be determined.
6. The foregoing must be worked out within the framework of the institution's overall objectives and goals.
7. Curriculum determines the types of spaces needed.
8. When classroom design is based upon traditional practices and traditional teaching methods result.
9. Faculty and lay groups should revitalize curricula through a "curriculum planning committee" prior to the construction phase.
10. School plants must be designed "from the inside to the outside."

Knezevich, S. J. "Your New School: A Procrustean Bed or a Functional Plan?" American School Board Journal, (March 1960), 35ff.

The author uses his title to make the point that "Preconceived ideas will arbitrarily impose conformity no matter what evidence there is to the contrary."

Preconceived ideas of what a school should be may be held by those involved in planning. This is a danger to be recognized and prevented. A good school plant maximizes the opportunities to achieve the desired objectives. The author then discusses the following areas:

1. Educational Specifications
    - a. Prelude to architectural design
    - b. Must be specific - not verbose and general
2. Ed. Spec. Problems
    - a. Translating what is taught and how it is taught into space requirements.
    - b. Planners are often far removed from the front line educational process (visitations should be made to gain first hand impressions of the existing situation, its strengths and weaknesses.)
    - c. Getting teachers to translate their knowledge of classroom strengths and weaknesses into facilities language.

(Consultants and other experts can assist in the development of specific steps and programs.)

3. Time and Talents Involved
   a. A minimum of six months should be devoted to ed specs preparation, a longer period would be even better.
   b. Teacher involvement does not mean teacher authority. Planners and administrators will ultimately be responsible.

In summary, the author states that Ed. Specs must be unified to get a sense of the total picture. This is not a simple task, since many of the teaching specialists are primarily concerned with their own area of interest.

McGuffey, C. W. et.al. Edspecs For the South Campus: Seattle Community College. Tallahassee, Florida: The Associated Consultants in Education, Inc., 1966.

This is a hefty document describing in detail the philosophy, curriculum, functions and facilities required for a new college. It was based on a long-range study, and is the first phase of the plan. Concepts for planning: plan for change, multiple use of space, daytime use primarily, integration of educational functions, and focus on the student.

Of considerable interest is a proposed system for the Resources for the Audio-visual Mode of Presentation, or RAMP. This is a highly developed approach encompassing all aspects of educational media and helping the instructors to utilize these media fully.

Silverthorn, Harold. "Common Misconceptions About Educational Specifications," American School Board Journal, 150 (February, 1965), 17-19.

Misconceptions:

1. Good educational specifications produce good buildings. "Interpretation of the program and educational specification, unless it develops into specifics, may not provide the type of structure visualized by the planners."
2. The superintendent is and should be the manager in charge of ed. spec. production. Silverthorn states, "Studies indicate that the superintendent is usually not qualified to perform the function of building planning." He recommends that the board hire a professional educator trained in this aspect of school-work who would be directly responsible to the superintendent, and through him, to the board.
3. Through interpretation of the ed. spec. the creative architect produces the "superbuilding" after a time of mental gestation.
4. The architect should have unlimited freedom in planning and designing a building.
5. Listing the activities of a particular classroom gives the architect a design concept for the building. The author says that the important consideration is not to list activities but to provide insight into trends, techniques, new programs that will influence the facility.
6. The edspec is the most important single element in securing a well-planned, functional building.
7. The architect is the key to a successful new building. The author states that coordination and the capabilities of the coordinator whether he be architect, educator, consultant, etc. is the most important element in planning.

Vague generalizations should be avoided in edspecs. If they are to be used at all, they "must be comprehensible, capable of visualization, analysis, and contain a list of concrete examples to illustrate the point."

Educational specifications are not an end in themselves.

Waite, L. L. "Educational Specifications - Key to Good Building," American School and University, XXXVIII (March, 1966), 32-35.

The author makes the following key points:

1. Facility performance is closely related to the quality of edspecs.
2. Edspecs formulation is the job of the educator, not the architect.
3. Edspecs communicate best when they are:
   a. Free from pedagogic jargon.
   b. Set the problem but do not hamper the design team in terms of solution.
4. Edspecs must be drawn with financial limitations in mind.
5. Desired quality level should be clearly stated in light of the continual development of new materials, "quality" is a relative term. Quality definitions should change as materials change.
6. All municipal and state codes should be complied with.

The author then presents a suggested list of areas to be covered in the edspecs from the book School Building Planning, by W. D. McClurkin. Although the list is too lengthy for inclusion here, it is an excellent frame of reference for anyone charged with the preparation of edspecs.

Wilson, William O. "Edspecs - Foundation for Good Building," American School and University, XXXVII (June, 1965), 38-40.

Architects cannot be expected to know the detail of educational planning: enrollment, subjects to be taught, teaching techniques, educational media, community use of the plant, student background, etc. His job is to design the plant after the administrator has supplied this (and more) information to him.

Edspecs should have as their starting point a statement of philosophy for the overall institution and a more detailed statement of philosophy for each individual unit. The comprehensive document cannot be a one-man job. To be effective, it must include all those who are actively engaged in the educational process.

Wilson provides a checklist to be applied to the edspecs and recommends that such a list be prepared for all the different divisions of a campus. In this manner, the administrator can anticipate a need before, rather than after the walls go up.

The Planning of Individual Buildings

Association of College Unions. "The Nature of the Union," Planning College Union Facilities for Multiple-Use. Madison, Wisconsin: Association of College Unions - International, 1966. 7-8.

The name "Union implies unity among students, teachers, and alumni. Almost every college has become concerned with the living problems of its students. Almost all have come to recognize that the campus environment furthers (or may deter) the fruitful use of student time and the learning process, that much of what students learn they learn from each other, and from faculty in informal association outside the classroom. The union is as normal and necessary a part of the college equipment as a gymnasium, residence hall, or library.

In the 1930's the leaders of the union effort began to see the union as the campus counter part of the "community center" elsewhere, with a positive recreational and educational mission to perform. So the union, as the campus community center serving diverse needs, now embraces a wide range of facilities and has multiple functions to perform.

It is a lounge, dining room, information center, student club headquarters, reading room, art gallery, workshop, theatre, music room, forum, game room, dance and party center, radio studio, ticket bureau, post office, faculty club, conference headquarters, and book store.

Barnett, Jonathan. "Laboratory Buildings: The Architecture of the Unpredictable." Reprint from Architectural Record, (November, 1965).

A look at ways to provide for flexibility and growth in labs.

1. The trend is toward comprehensive systems of laboratories of an interdisciplinary nature. Labs must be made convertible between disciplines.
2. There are four basic areas in a lab complex: Labs, administrative offices, general support facilities and service. A master plan must make provision for independent growth in all four.
3. Laboratories for research require desk space, bench space, controlled environment, conference rooms and extensive storage.
4. Economy of construction can conflict with economy of operation.
5. College buildings tend to have more individual requirements built into them than industrial laboratories do.
6. Mechanical services can be distributed horizontally or vertically: Horizontally--whole spaces of floors for mechanical equipment with vertical chases at the end of the building. Large vertical service shafts at convenient locations.
7. The typical requirements are moving closer to that at Olin Hall of Science - an entire peripheral wall is a pipe chase. This allows almost complete change.
8. Little information exists on optimal working environment, but the widely accepted 10 ft. module is often not enough.

"Berkeley: A Place Where Things Can Happen." College Management, II (May, 1967), 73-76.

Berkeley's architects, Hardison and DeMars of Berkeley, designed a college union where things can happen. Four separate buildings were utilized; the cafeteria building, the union building, a theater-auditorium building, and an eight-story student activity building. A series of plazas and courts are shared by the buildings. Open spaces--landscaped with trees, massive planter, classical stairs, and overhead pedestrian walkways--separate and link the four structures.

Some of the action is underground. A 120-car parking lot, a barber shop, and a bowling alley are located in the basement of the union building with elevator connection to the upper structure.

The union building itself houses on the first floor a coffee shop, the campus store and bookshop, a game room, and an arts and crafts workshop. The main (second) floor contains a spacious lounge with information desk. The third floor provides a ballroom and two formal lounges. Meeting rooms fill the fourth floor while the fifth (top) floor houses a meditation room flanked by two roof gardens.

The ground floor of the cafeteria building contains the band and glee club rehearsal rooms, plus offices for four more musical organizations.

The theater-auditorium is a separate structure with a 2,000 seat chamber and a 550 seat experimental theater with provision for unusual staging techniques.

Brotherton, F. Philip. "Campus Aesthetics." College Management, II (February, 1967), 53-67.

Colleges are educational institutions, but their buildings need not have an institutional look. A college is far more than functional classrooms, cafeterias, and offices. It is an atmosphere, an atmosphere created in large part by buildings. If structures are routine, dreary shapes, molded only by their functions, the campus is routine and dreary. If the buildings themselves are beautiful, the campus is alive.

Beauty does not necessarily cost a lot of money. What is required even more is care, imagination, and above all, the constant reminder that the campus will house human beings, not functions. Ugliness costs, too, and its costs are far higher than a slight budget increase.

Six ways are presented in which a campus can be made more beautiful or interesting through architectural care:

1. Most burgeoning campuses are so huge, so overpowering that they almost cause a new student to cringe. Plazas and courtyards may be used to bring large campuses down to human scale.
2. Interior courts may be used to blend the old and the new. Urban colleges can turn inward to create quiet, landscaped gardens instead of channels between buildings.
3. Textural rhythm is visual or tactile. In structures, a pattern of solids and voids creates a visual rhythm. Glass is a visual void but a solid surface. Tactile surfaces have a finer texture--created by the rough and the smooth, the dark and the light.
4. Inside, texture sets a mood or tempo. Soft, bland textures signal repose. Bright, hard, shiny surfaces

say motion and provide an intellectually stimulating study area. Juxtaposing hot and cold colors creates a physical desire to move.

5. Glass walls can link two worlds, can unite outdoors and indoors. A narrow space that might otherwise be unimportant, or even claustrophobic, becomes a pleasant conversation or reading area if linked to the outside by glass. A view provides visual relief for the reader, and a subtle satisfaction in just knowing what the weather is like outside.
6. Mood is set with color, texture, and form. These design qualities are seen and emphasized by light. Harmony depends on placing emphasis in the right place and in the right amount. The answer to lighting needs is not the flourescent tube or a high level of foot-candles. Lighting, spectacular or unobtrusive, casts a mood and sets the tone of the room it lights. The effect is more important than the fixture.

Butler, John H. "Formula for Faculty Offices," College and University Business, XXV (September, 1958), 25-27.

1. Classrooms and faculty offices should be as near to each other as possible. It is not possible financially to have a faculty office adjacent to each classroom but they should certainly not be in another wing or building. It is possible to design classroom buildings so as to get faculty offices very near to classrooms.
2. Office needs should be determined prior to planning classroom buildings. There should never be too few or too many office spaces for any length of time in a well-planned building. A general formula for determining faculty office spaces has been devised by the author. As long as conditions remain constant, the formula will be reasonably accurate. The formula can also be adapted to special conditions such as part-time faculty, evening programs, graduate student offices, and professors who do research.
3. To complement the formula, the building can be planned for maximum flexibility. The building can be so designed that office blocks can be remodeled into classrooms and classrooms into offices.
4. The formula is as follows:

$$\text{Number Office Spaces Needed} = \text{Number of Classrooms} \times \frac{\text{Hours per week average classroom must be used}}{\text{Hours per week taught by average instructor.}}$$

Carioti, Frank. Relocatable School Facilities. New York: Educational Facilities Laboratories, 1964.

A report of "non-permanent" structures in 23 school districts covering 10,000 structures. Case studies:

1. Basic types
    a. Portable - moved as a whole
    b. Mobile - "trailer" type structure
    c. Divisible - Mobile-modular units put together on site.
    d. Demountable - disassembled and moved.
2. Excellent cost analyses and case studies.
3. A Plan for the Future
    a. A permanent core structure for possible relocatable structures with utilities built in.
    b. Serves as classroom - demonstration area until needed.
    c. Classroom shells are "plugged-in" when necessary
    d. Brings temporary space into mainstream of school activity.
    e. Cuts down cost, particularly servicing, moving.
    f. Allows expansion and contraction as population shifts.
    g. Could also allow mobile units to tie-in at regular intervals for better utilization.

Carpenter, C. R. "Closed-Circuit TV for Resident Teaching." College and University Business, Vol 24 (February 1958), 17.

Closed-circuit TV systems when used in conjunction with films, graphic demonstration methods and kinescopic recordings provide colleges and universities with highly efficient means for distributing and presenting a wide variety of information and instruction.

Experience at Penn State with instructional TV systems has resulted in the following observations:

1. Closed-circuit TV for presenting courses to large numbers of students does not affect adversely their learning.
2. Televised instruction in large multiple section courses is both feasible and acceptable on a continuing and expanding basis.
3. TV systems costing from $5,000 to $50,000 should be amortized over a period of five to eight years.
4. Although helpful TV is no substitute for excellent teaching and dedicated faculty members.

"Case of the Empty, Overcrowded Classroom." College Management, II (March 1967), 26-33.

Colleges are turning away qualified students for lack of space while their classrooms stand empty 50%, probably 75% of the time. Most colleges could probably increase capacity by at least 50% without extending their year and without putting a single new building on campus--merely be modifying their scheduling pattern.

Scheduling is a matter of fitting parts in charts, a mechanical, if sometimes arduous, procedure, according to Professor Robert Burns. The Burns system for scheduling suggests a grid or block in which a 5 1/2 day week is divided into four daily time zones - 8-10, 10-12, 12-2, and 2-5 - except Saturday, when classes end at 1 p.m. Into this system are fitted the three kinds of courses: core, specialized, and elective, scheduled in that order.

Intensive scheduling by this method can lead to 88% utilization of space without sacrificing any elements of the educational program. The design approach seeks modular forms that fit the character of the curriculum more appropriately and more functionally. Modular in this case refers to a course unit or a combination of course units which has a multiple relation to the frame of the schedule, i.e., as for two three-hour sections in a six-day week.

To increase a present program to capacity within existing facilities, set target enrollment at 80% of theoretical capacity (number of rooms times weekly hours in schedule times average number of seats per room, divided by average student hours per week per student.)

A nine-hour day (8 to 5) for six days yields 54 hours. If the 3 to 5 period on Wednesday and the 1 to 5 period on Saturday are eliminated, a 48-hour week remains. This 48-hour week can be divided into four 12-hour blocks for scheduling.

Close, Winston A. "Windlwless Classrooms in New Building for Social Science," College and University Business, IX (July, 1950), 32-33.

The major classroom buildings on the University of Minnesota campus are of Renaissance design. The campus union is of contemporary design. Space requirements of the new building (the need for five fully usable floors) and the desired fenestration system called for a departure from the Renaissance style of the older campus.

"The grade entrance, stone portico, and simple window openings of the proposed building recall a similar treatment of the Coffman Union, but harmonize in mass and scale with the older buildings of the upper mall."

Interesting factors:

1. No windows in any of the classrooms. They are well ventilated. This will give better control of lighting and be excellent for the use of visual aids. (The lights are always on anyway.)
2. Seminar rooms on same floor as offices and just across the hall.
3. Movable walls used in the office and small classrooms for ease in changing the area around.
4. Windows are on the third through fifth floors for the offices.

Cochran, Lee W. "Developing Adequate Learning Spaces," College and University Business, XLI (October, 1966).

Media requirements:

1. Ceiling height adequate to eliminate shadows.
2. Front row seats no closer than two screen widths.
3. Screens should be planned for each classroom
4. Amount of light must be controlable.
5. Adequate air conditioning must be provided.
6. Acoustics should be considered to remove anoyance factor.
7. Seating must be arranged for viewing.
8. Classrooms must be planned for the future.
9. Remote controlling is preferred.
10. Building should be pre-wired for media.
11. In planning for the future - consider the student response systems.

Cocking, Walter D. "Educational Planning of College Plants," American School and University, Vol. 29 (1957-58), 111-120.

To date (1957) very little education planning has taken place even though there has, and continues to be a great need. Because of the contemplated increased enrollments, and the new construction that will go with these increases there now exists an excellent opportunity for increased educational planning. If it is carried out significant economies will result.

"Economy in building is principally achieved to the extent that the uses of a building are foreseen, and adequate and flexible facilities are provided."

A college plant differs from the primary and secondary schools and for these reasons educational planning is a much more complex and intricate business.

One basic implication of educational planning for colleges is to identify the problems and then make a coordinated approach to solving the problems.

Cornell, Francis G., and Cromwell, Edwin B. "For Science Facilities Planning Becomes Crucial," College and University Business, XXX (February, 1961), 52-55.

Science facilities are high on the priority list of capital requirements of college. These spaces are costly and of little value to other college departments. The right kind and right amount of space, therefore, must be provided in the new science structure. An attempt must be made to anticipate the future size of the institution. Its future academic role, and the future enrollment in the science department itself. An analysis dealing with anticipated instructional methods must be made.

In determining science spaces, it is logical to consider problems of size of classes and groups for lecture and laboratory, scheduling of classes, possible utilization of classrooms and laboratories in weekly hours, distribution of student time among lecture, laboratory and individual study or research. Space requirements for student and faculty research are a necessary factor in planning any higher education science facility.

The authors deal with the planning of a science building at Little Rock University and how five kinds of space was considered necessary:

1. Interchangeable classrooms without special laboratory equipment.
2. Science lecture rooms with facilities for demonstration.
3. Specific-purpose classroom and laboratory. Classrooms for analytical chemistry and organic chemistry are special-purpose rooms.
4. Multi-purpose classrooms and laboratories in which facilities can be shared. Physics and earth science laboratories are examples of shared space.
5. Special laboratories for special subjects. The darkroom and the animal room are spaces of a highly specialized sort.

DeBernardis, Amo, and others. "Planning the Classroom for New Instructional Media," Planning Schools for New Media. Portland, Oregon: Division of Education, Portland State College, 1961. 23-33.

Through the use of such media as films and television, the teacher is able to extend his teaching beyond the confines of his personal knowledge. Such media are valuable only if teachers use them to promote clearly defined instructional purposes, and if working conditions, distribution systems, supplies, and equipment make it possible for teachers to use materials and equipment as they need them.

In this section, the authors summarize the use of classroom lighting, ventilating and heating, sound control, electrical wiring and other matters which must be carefully planned.

Doi, James I. "Planning for Faculty Office Space," Higher Education XIV (February, 1958), 96-99.

1. In the Manual for Studies of Space Utilization in Colleges and Universities only three-fourths of the institutions examined office space. Other non-academic space was examined even to a lesser proportion.
2. The emphasis on studying classroom and laboratories is understandable but becomes a hazard if it tends to develop blind spots to plant capacity.
    a. Classrooms and labs usually comprise about 40 per cent of the plant.
    b. A larger enrollment may be accommodated in the classroom and labs, but will the other service facilities be adequate?
3. Faculty office and research facilities is often a blind spot.

a. Accepted requirements for faculty office space is 120 square feet.
b. Range may be no less than 75 square feet and no more than 174.
c. Remodeling or using room originally designed for other purposes often leads to poor faculty offices. (One-third of the offices in eight institutions were so labeled.)
d. Sharing space and thin walls is a frequent complaint.
e. Providing poor office space may handicap institutions in the talent competition.

"Douglass Building Avoids Towering Costs." College Management, II (February, 1967), 46-48.

Douglass College (Rutgers) in New Jersey has put its faculty members in an ivory tower high above the swirl of student life. Over 100 teachers have offices in the college's four-story, white, concrete-and-glass bastion in the middle of the academic action--an office - classroom - lecture hall complex.

Several unusual design techniques were employed to make the building fully functional as well as financially feasible. The structure is sprawling. It is divided by function into four sections linked by stairs and corridors. Two large lecture halls lie at either end of the oblong layout with a bi-level 33-classroom building between them. Topping the classroom building is the four-story faculty office tower.

Hexagonal shapes with tiered seats inside were used for the two lecture halls. The acoustics were designed for music as well as lectures.

The 33 classrooms are of all sizes in a square building with a mechanical equipment core surrounded by a pinwheel-like corridor which opens on all classrooms and ultimately feeds into the two lecture halls. The classrooms are positioned so that their shorter, rather than their longer, sides are turned against the outside walls.

Each story in the faculty tower houses twelve 11 X 15½ offices for two faculty members each. Conference rooms, a kitchen, a lounge, a workroom, and two passenger elevators are included in the tower.

Evenden, E. S., G. D. Strayer, and N. L. Engelhardt. Standards for College Buildings. New York: Teachers College, Columbia University, 1938. 1-22.

This book is prepared in the form of a checklist for the evaluation of standard college buildings. The first chapter, dealing with site, provides rather extensive lists of considerations concerning: a. accessibility; b. general environmental factors of the city; c. immediate environment of the college; d. size and form of the campus; e. landscaping and upkeep, and f. elevation and drainage.

Chapter two deals with the building facilities on the campus. The campus master plan should provide for a building plan that will account for expected development of the college for a fifty-year period. Such a campus plan should be generalized as to not retard or impede future needs as they may develop. Check lists are provided in this chapter for the evaluation of: a. campus plan; b. foundations and supporting walls; c. fenestration; d. type and architectural consistency; e. materials; f. roofs; g. stairways and stairwells; h. corridors; i. modifiability; j. basements; k. doors; l. attics; m. floors; n. walls and ceilings; o. woodwork; p. color schemes; q. condition of upkeep.

Freese, Gordon P. "Exploring the Possibilities of Teaching by Closed-Circuit TV." College and University Business, Vol. 24, (February 1958), 24-26.

At Stephens College in Missouri it was found that closed-circuit TV was an ideal way of reaching students in nearby classrooms at a relatively modest cost.

Advantages to Stephen's program were as follows:

1. A lecture could be presented simultaneously in 50 different classrooms, after which an instructor in each room could then lead the class in discussion of the subject presented.
2. Students divided into smaller class sections had better contact with the lecturer than would have been possible in a large lecture hall seating 900 to 1,000 students.
3. Science demonstrations, where every student needs to see at close range everything that takes place in an experiment, were much more effective on TV than would have been possible in a large lecture hall.

Possible future uses of the closed-circuit system were as listed:

1. The elimination of classroom projection of films and slides by the instructor.
2. Observation of classes without interfering or distracting the students.
3. The simultaneous multiple section teaching by one instructor.

Again, as has been pointed out in other articles, closed-circuit TV does not take the place of good teaching and properly motivated students - but it can be of assistance to both.

"General Motors Technical Center," Architectural Forum, Vol. 95, No. 5, (November, 1951), 111-123.

Versatility and flexibility of present and future use of this laboratory was achieved by the following methods:

1. All environmental controls of this free standing space were provided for in the ceiling.

2. Building module spacing used to create ceiling grid with following features:
   - a. Direct or diffused lighting depending upon desired use.
   - b. High velocity air conditioning outlets located in nodes at intersection of ceiling grids.
   - c. Regular pattern of sprinkler heads located in nodes of other ceiling grid intersections (grid intersections at every 5'2".)
   - d. Sockets at nodes provided to receive uprights of movable interior partitions.

Acoustical abosrbent material also incorporated in ceiling sections.

Godshall, William V. "Trends in School Buildings: Equipment." The School Executive, LXXV (August 1956), 75-76.

A project had the object of a building planned with adequate facilities and a program to meet today's educational needs yet flexible enough to change with the years. Educational consultants, the architect, the board, the professional staff, and representatives of the people in the community all had a part in determining needs. The planning recognized the learning habits of students and the techniques which should be employed by master teachers.

The opportunity for staff members to help select equipment is highly valued by teachers. Too often they inherit equipment, supplies, and even courses of study, and are not privileged to be a part of the planning team.

The planning and execution of a program such as this one for selection of equipment will provide assurance that the school will be well equipped to meet the educational needs for years to come.

Green, Alan C., "Design Seeks New Ways to House the New Instructional Technologies," College and University Business, XXXv (September 1963), 47-49.

Two architectural research projects are reviewed. They give emphasis to the concept that optimum utilization of instructional aids and media requires new concepts of space types and their design. These two projects and their related activities illustrate the four steps necessary in the development of a new facility type or a new system of facilities: (1) definition of need; (2) development of planning data and design criteria; (3) construction and evaluation of an experimental facility; and (4) construction of the prototype.

Facilities must be specifically designed to house the new instructional processes; makeshift or multi-use spaces will not do.

The two research projects are: (1) project DASFEE (Design of Auditorium-Studio Facilities for Engineering Education) at Renssalaer Polytechnic Institute, under grant from Educational Facilities Laboratories, Inc.; (2) extensive architectural research, evaluation, and modifications toward optimizing the design of this facility type. Project DASFEE resulted in the publication of a report, "New Space for Learning - Designing College Facilities to Utilize Instructional Aids and Media." The report presents general planning information, detailed data on design criteria, and a series of design studies all directed at assisting the architect and administrator in developing improved facilities.

Nine broader implications brought out in the study and ten planning and design criteria are discussed in detail.

"Grinnell's Union: A Place to Relax--Quietly." College Management, II (May 1967), 64-67.

Planners at Grinnell College found many answers to the question of what a student union should be, but adopted the concept of a place where the individual student could go to relax in a pleasant, quietly animated atmosphere.

A low-key union with such eminetly personal features as private student kitchenettes was created by the architect, Skidmore, Owings, and Merrill, of Chicago.

Basically two floors, the union contains seven different levels with varying ceiling heights. This variety allowed the architect to create spaces uniquely styled to house a function and an atmosphere.

Large areas are shaped and furnished to stimulate conversation in the tradition of the European salons. The rooms focus on the person. Lighting is subtle; there are no massive, imposing chandeliers hanging from the diagonal beams. In addition to being planned for intellectual coffee klatches, the rooms are made for the solitary individual as well. Each room contains peripheral areas where a lone reader can find quiet without the necessity of locking the room.

Fully equipped kitchenettes on the lower level have met with pronounced student favor. Students use the kitchenettes on a reservation basis, supply the food, and the union supplies the facilities and equipment.

The two floors of the building are divided into three environs, loosely labeled "noisy," "quiet," and "functional."

The forum, as the union is called, is a gateway to the campus. Students come to the union for breakfast and then "enter" the campus for classes.

Halstead, Edward Grey. "Laboratory Equipment," Progressive Architecture, Vol. 37 (September 1956), 126-137.

Design and layout of laboratory equipment should proceed hand-in-hand with the development of the design for the entire building so as to insure functional, efficient, and economical laboratories.

Architects should make use of specialists in the laboratory equipment industry to effect economies through use of modular type standard production equipment units.

Areas and conditions in science facilities which should receive the architect's particular attention are:

1. Ventilation and air-exchange
2. Duct and drain materials
3. Capacity for conversion for future changes
4. Utilities and emergency shut-off controls
5. Lighting
6. Temperature and humidity control
7. Storage space
8. Wall, ceiling, and floor finishes
9. Safety

Laboratory equipment specifications should be separated from the general contract.

Development of modern technical laboratories results from the cooperation of architect, specialized equipment manufacturer, contractor, and owner.

Hickman, Warren L. "Campus Construction for Academic Survival," Journal of Higher Education, Vol. 36 (1965), 322-330.

All colleges particularly the small private colleges must build facilities for the future. Those buildings which are constructed today must last into the 21st century without replacement. Therefore, they must consider those new techniques which will become standard practice in the 1970's. With this background planners must consider the following:

1. "Advice from the faculty is an absolute necessity."
2. The administration must act as a moderator in the discussions with the faculty and architect in order to prevent "empire building" on the part of some faculty.
3. The new aids being developed to assist lecturer in handling larger sections which require specially designed facilities.
4. The new visual and audio aids which make larger classes and independent study both practical and possible.

"There is little justification for failing to take future needs into consideration in planning the construction of new buildings." P. 330.

"Hofstra's Union: A Front Door to the Campus." College Management, II (May 1967), 68-69.

Hofstra's union is the gateway to its campus. The architects, Warner, Burns, Toan and Lunde, of New York City, spanned the road with a cantilevered concrete bridge linking the multi-story library, near the parking lot, with the union -- a two-building complex enclosing a central plaza -- on the other side.

Commuting students pass through the library from the parking lot and cross the bridge to the union. Dormitory students pass through the union from adjacent dormitories and cross the bridge to the library. The union is thus a channel as well as a gateway that all students use regularly.

Two enclosed walks link the commons building of the union to the student activities building. Outside, interest focuses on a concrete bell tower with an open staircase under a vast skylight.

Hyde, Bryden B. "Housing the Physical Sciences," College and University Business, Vol 23 (August 1957), 33-35.

Features of the physical sciences building at the University of Pennsylvania are as follows:

1. Bright entrance lobby with large display cases serves dual purpose as a gallery for weekly public teas.
2. Three air conditioned lecture rooms open off on the gallery-like lobby, with two of them seating 100 each and the third equipped to seat 250.
3. Location of the lobby and lecture rooms permit students from other departments to attend lectures in these rooms without conflicting with normal intra-building traffic.
4. Worktables in the labs have outlets for gas, air, and alternating and direct current.
5. Coaxial cables are built into the walls to permit piping of various microwave frequencies throughout the building.

"Kent State Remodels and Saves $1,810,000," College Management, (April 1967), 35.

Kent State University remodeled two existing dormitories and then built a twin-tower dorm with the money it saved. They hired one contractor to do the entire job from patchwork to furnishing. The fees of students in the remodeled dorms will pay for this cost in two years. The money from fees will then be used to pay off the new dormitory.

"My question is, what do they have in the remodeled dorms? . . . Probably what they have put inthem in terms of dollars."

Knezevich, S. J. "Glass: The Controversial School Building Material," American School Board Journal. Vol. 141, No. 1 (July 1960), 23-26.

Glass has become a very widely used building material, not only for windows but for walls, etc. There are many people who think that it is great and there are those who feel just the opposite.

There are many kinds and types of glass:

a. heat absorbing b. tinted c. thermopane
d. glass block e. numerous others

The problems associated with all glass revolve about these three:

1. Daylighting - too much light and in concentrated amounts which must be harnessed to be used. Attempts to do this involve overhangs, louvers, blinds, etc. Windowless classrooms do not solve the problem, they merely avoid it. Note: Solving this is complicated by the fact that each day the sun follows a different path.
2. Solar heat gain - sunlight brings with it heat. This too is often excessive. It can and does cause discomfort even in the north. Air conditioning can take care of this but it is expensive. Exterior grilled walls, shades, venetian blinds, drapes, etc. all are used to solve this problem and where air conditioning is installed to cut down on the air conditioning load.
3. Winter heat loss - this can be substantial particularly in the northern climates. Double glazed windows and curtains all aim at controlling this.

Larson, C. Theodore. "Environmental Design Implications." SER 3: Environment Analysis. Ann Arbor, Michigan: The University of Michigan, 1965, III.

SER 3: Enrironmental Analysis is the third in a series of reports being published by the University of Michigan's Architectural Laboratory on the work of the school environments Research Project. This report is an attempt to answer the question: how does the environment affect human behavior? The search for the answer has been actively under way at the University of Michigan for the past dozen years.

With the development of new synthetic materials like the plastics and the light weight metal alloys and with the introduction of new fabrication and construction techniques, there has come a new freedom in design.

The term "architecture" is in conflict with the more dynamic concept of "enrironmental design." (in a sense.) Instead of being looked at as an end in itself, a building should be looked at as a means to a larger end - a thing intended to promote the well-being and increasing productivity of all its occupants. The design objective is to develop specific environmental units that will facilitate the development of each individual to the fullest extent of his innate capabilities in line with continually rising standards of productivity.

The specific units of environmental design may be as small as a play yard or a study carrel. Each unit, however, must be conceived as part of a larger entity, and these in turn as part of still larger entities. The more comprehensive the design continuum becomes, the more important is the question of how the various components can be altered to meet new requirements in development of elimination entirely when no longer needed. "Global cooperation in environmental design becomes imperative when the total design continuum begins to attain extra-terrestrial dimensions.

McGuffey, C. W. et. al., Long-Range Planning for Seattle Community College: A Plan for Development. The Associated Consultants in Education, Inc. 1966, 131.

The implications to faciltiy planning of the "Seattle Study" seem to be pertinent to other colleges. These include:

1. The president and his staff should not be located on one of the college campuses.
2. Adequate facilities should be planned for the president and his staff to facilitate the services needed.
3. Each campus should have facilities for faculty and staff offices, secretarial offices, testing rooms, conference rooms, and storage space for student records.
4. There should be a student center on each campus.
5. The materials center should be planned in relation to the programs which will use it.
6. The facilities should be appropriate for a broad range of age groups.

Metcalf, Keyes D. "How to Avoid Common Mistakes in Planning Libraries," College and University Business, XXXVI (March 1964),

Decisions on the following questions are basic to planning a library:

1. Can and should a new building be avoided by alterations, additions to the old, or by decentralization of services?
2. Open or closed stacks?
3. Is service to be centralized, divided by subject or by physical form?
4. What per cent of individual accommodations?
5. What plan for supervision?
6. What about smoking?
7. Will there be functions other than the library?
8. What about future growth?
9. Where will the building be placed? Be careful of centralizing. It sometimes becomes difficult to expand.

"Parking," College Management, (May 1967), 50.

Commuter campuses are swamped with cars and especially in the acute urban areas. Land purchase for parking can be prohibitively costly and local street parking can be impossible.

Akron University in Akron, Ohio has solved this problem by "built-under" parking. The urban university built its science and engineering center on top of a multi-level parking facility.

Using semi-standard design, Akron built an "L" shaped structure. The long leg contains two parking levels and the short leg, three levels. In all, parking space for 345 cars is provided. On top of this structure is erected three five-story towers, a classroom-lecture hall building and a library with a mezzanine - in all 227,000 square feet of column-free floor space. Total cost = $10.5 million.

Pierce, George F., Jr. "Here is a Practical Approach to Laboratory Design," College and University Business, Vol. 26, (March 1959), 40-43.

In designing a laboratory building the following considerations should influence planning:

1. The building should provide built-in adaptability to changing requirements of scientific technology and education.
2. The building should be adaptable to changes in enrollment.
3. The building should conveniently provide every kind of utility service to any location in the building - both now and in the future.

Final design was based on eight fundamental criteria:

1. The building must have adequate space for present and foreseeable future needs.
2. The building must be flexible (what he really meant was that it must have a capacity for change.)
3. The building should be planned with expansion in mind.
4. The building must be economical to maintain.
5. For safety in the laboratories, space should be individually air conditioned and heated.
6. The building must be related to existing structures on the campus.
7. Overall planning should incorporate economy as one of of its salient features.
8. The building must reflect the highest standards of architectural desing.

Riker, Harold C. "The Physical Facilities," College Housing as Learning Centers. Washington: American Personnel and Guidance Association, 1965. 31-41.

Riker recommends 90 square feet per student in a double room as a minimum, with 100 square feet per student a more desirable average. For the typical 12 X 15 room, he recommends a 7½ foot ceiling.

The trend in housing for upper division students seems to be toward suite and apartment type facilities. They provide more independence and freedom from supervision. At the same time long, noisy corridors can be avoided. Study spaces, small libraries, and/or reading rooms, music listening rooms, multiple-purpose rooms, eating facilities, entrance lobby, service facilities are all essential to the design of a successful residence hall.

Riker, Harold C. "Social and Physical Environment," Planning Functional College Housing. New York: Teachers College, Studies in Education, n.d., 61-80.

The college residence hall should be viewed by educational planners as a totality composed of four

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"Science Faci [illegible] ies: Bu [illegible] ge." College Management, I (October 1966), 45-46.

Two prime considerations--flexibility to meet tomorrow's changing science needs, and economy to meet today's budget limitations--have been judiciously balanced in the new science building at State University College in New Platz, New York.

This building is the second science facility surveyed in a portfolio of building ideas surveying six science facilities under the caption "The science you teach today will be obsolete tomorrow. The facilities shown . . . will not be."

The first level of this new state university science building is devoted to a lobby, lounges, a nuclear laboratory, and animal facilities for an adjacent science building. Second and third levels provide laboratories for the earth sciences and physics.

The laboratories are not separated by intervening service rooms. Rather, they are placed side-by-side, one end opening onto a student corridor, and the other end onto a semi-separate "back stage" area for materials and supplies, and where faculty can shuttle back and forth from adjacent offices without dodging student traffic.

Sliding walls, surfaced with chalkboard or display board, opening to one-third the width of the lab, make this "back stage" area accessible to students during instruction periods. The "back stage" area is also available to faculty members for personal research and for working with advanced students.

The side-by-side lab grouping makes it possible for the labs to be grouped or regrouped by department or function. In some cases, walls can be easily removed to combine two laboratories.

Within the labs, fixed elements are restricted to outer perimeters, and standardized but convertible furniture components are used.

A "mechanical mezzanine" runs horizontally between the second and third floors, carrying piping, utilities, and ventilating ducts for labs above and below and adding to the features designed to accommodate changing science needs as well as providing the basis for the building's own regeneration and renewal.

"Science Facilities: High Usage, Multi-Purpose Laboratories," College Management, I (October 1966), 41-44.

A portfolio of building ideas surveys six science facilities under the caption "The science you teach today will be obsolete tomorrow. The facilities shown . . . will not be." The first facility surveyed, a high usage, multi-purpose laboratory building at Southern Illinois University, comes close to offering each student his own facilities while getting high usage out of 768 laboratory work station.

A unique system of equipment storage assigns each student a drawer which he may remove and take to a work station at any laboratory. Special laboratory furniture was designed to meet unpredictable future needs.

Every laboratory can be altered to accommodate any physical, chemical, or biological science. Changing a laboratory from one usage to another is largely a matter of installing the proper removable benchtops. Biology benches require running water and a sink at each position; chemistry benchtops must be resistant to all kinds of chemicals in addition to having water and sinks available; for physics the need is for flat surfaces with only gas and electrical services at each position.

The biggest problem in changing a laboratory from "wet" to "dry" is maintaining the ability to convert it back again when necessary. This is achieved by bringing all services to a utility cabinet at every laboratory position.

Flexible-use laboratories offer the university full utilization of all its science facilities - regardless of shifts in student demands.

Sharp, J. Stanley. "Architectural Steps in Facilities Planning," Audiovisual Instruction, X (February 1965), 101-103.

1. The degree of success of a project will depend upon the ability of the client and the architect to work together constructively.
2. The educator must collect the following information with regard to the project in which the program is to be housed.
   a. Should explain how these various activities have been accomplished in the past.
   b. What purposes are served by the program?
   c. How is the program being handled now?
   d. Purpose of the program.
   e. Program must describe various departmental activities.
   f. Specific space needs for equipment and those utilizing the space must be spelled out.
3. Each function of the program will have special needs of problems and functions should be described in detail.
4. The architect reviews the program, visits the site, and then has a series of conferences with the client. These meetings can afford the architect the opportunity to ask questions and discuss, for client reaction, tentative ideas for arrangement of details and relationships. Greater refinement takes place with each meeting as more detailed information becomes needed.
5. A preconceived project cost is a most common mistake; It usually bears little relation to the needs as defined by the program and dictated by the site.
6. Steps in developing a school facility from the standpoint of the client and architect were given.

"Swivel Seats Create Versatile Classroom." College Management, II (April 1967), 36.

For a nominal $500 additional per room, lecture rooms in a new business college at Indiana University were each equipped with 100 swivel seats permanently bolted to the floor in ten rows. The seats turn in full circle, and chalkboards surround them on all four sides.

There is thus no "back" of the room. The center of the room is the farthest "back" a student can sit. The room is particularly useful for "team teaching" situations in which different professors can station themselves anywhere in the room.

Classes can be broken into small discussion groups by having students simply swivel into circles. The swivel chairs also convert the classrooms to study halls when they are not otherwise in use. Students can turn away from distractions or swivel into a circle for review sessions.

Plans are underway to make the classrooms into audio-visual learning centers with each room having film and slide projectors, projection screens, and CCTV receivers.

"Teaching in the round peps up a class. After all, there are no hiding places."

"Temporary Structures," College Management, (January 1967), 68.

Orange County Junior College District in California leased an entire 2,000 student campus of temporary buildings from Modulux Inc. The buildings are made of modular units (10 by 32 each), made of structural steel and fiberglass-reinforced plywood.

It took only 74 days to erect the 19 structures, complete with classrooms, laboratories, health center, administrative offices, bookstore, and library. All are fully air-conditioned and except for the laboratories, fully carpeted. When the permanent buildings are completed, Cypress J. C. will move in and the temporary structures will be taken down, loaded in flatbed trucks and leap-frogged to another beginning campus.

"Ups and Downs for Business Building," College Management, II (April 1967), 35-36.

A six-story classroom structure is not usually justifiable due to time consumed, congestion created, and the physical effort required to move from floor to floor. In metropolitan centers where the college is cramped for space, a vertical construction is never-the-less often a necessity.

In Atlanta, the six-story classroom building for business education at Georgia State College provided facilities that would have required three times as much land for walk-up buildings of comparable capacity. The disadvantages of traffic time, congestion, and effort were avoided by the use of escalators. The cost factor was favorable in comparison to the additional land cost thus avoided.

The utility factor was also made favorable by the use of escalators carefully installed to avoid conflicting traffic patterns. Ten escalators were installed. The capacity of each escalator is 8,000 persons per hour. Permitting passage between floors in 15 seconds and from the first floor of the sixth floor in 1.5 minutes.

The capability for handling continuous traffic without lost time due to stop-and-go travel favored the escalators over elevators, although some self-service elevators were still needed in order to handle wheelchair and other non-ambulatory cases as well as freight.

Van Nuys, Jay C. "Trends in School Building: Form and Structure." The School Exectuive, LXXV (August 1956), 68-70.

Buildings, historically, have often been planned to fit preconceived design concept regardless of space relationships, space-use, or other basic criteria. Technological developments in the past two decades offer the designer a palette of diversified materials and techniques of a scope never before contemplated, but something more than a mere substitution of new materials for old is needed.

Educators have explained in detail the educative teaching-learning processes. The job of the architect is to create architectural forms that will adequately house these processes. The space around and between buildings must be designed with the same care as spaces within a building. Indoor-outdoor relationships in the framework of desirable environmental conditions will, if properly studies, prove a powerful factor in the resulting design.

The auditorium, for years a standardized element, has undergone some rather startling changes, attributable primarily to the manner in which this facility is now used. Cafeterias, no longer considered as mass feeding spaces, are changing in shape, size, and proportion.

Wider acceptance of the type of educational program that results in decentralization of educational elements within a school gives the designer an additional responsibility of vast importance. The physical separation of buildings is relatively simple to achieve but must not be done in a manner which might give the feeling of isolation. If properly executed, the overall plan will express the need of small group expression while at the same time being a part of a large or total group.

The growing trend toward a return to integration of the fine arts in architecture will not only result in structures which are more pleasing esthetically but will also become educational tools in themselves.

Wattenbarger, James L. "Planning Facilities for Junior Colleges," Junior College Journal, Vol. 30 (May 1960), 539-543.

1. In planning facilities the author recommends:
   gather as much information as possible
   translate specifications into buildings that are functional, that are economical to build and maintain, and are attractive to look at and live in.
2. Type of construction and general design:
   a. Provide flexibility for future growth and use.
   b. Provide for minimum maintenance
   c. Preserve beauty of site.
   d. Maintain proper building relationships to each other and to walks, drives, and parking areas.
3. Unique requirements: Commuting students need -
   a. Larger library reading room
   b. Larger lounge and other study areas
   c. Well lit walks and parking areas for night use.
   d. More parking areas and efficient traffic flow.

Youtz, Philip N. "Sources and Resources for Architectural Design." Florida Architect, XIV (March 1964), 13 ff.

Ten categories of sources available to the modern designer are presented as provocative, modern in orientation, and intimately connected with architecture:

1. The architect's own cultural background
2. A new definition of architecture derived from anthropology.
3. Mathematics
4. Structure
5. Physics
6. The trend toward factory fabrication and site assembly.
7. City planning
8. Automation
9. Transportation
10. Research

IV

PLANNING THE TECHNICAL ASPECTS

"Air Conditioned School Designed for Year-Round Use," The American School Board Journal, CV (April [illegible]), 67.

1. High School in Pelsin, Illinois
   a. Cost 4.2 million dollars
   b. Two thousand student capacity, four buildings
   c. Starting with small summer classes, usage will increase until school operates year round.
2. Air conditioning system
   a. Expected to cost $80,000 but came within original budget.
   b. Use natural gas to drive 525 ton compressor.
   c. Cost of fuel for air conditioner = .0045 cents per ton per hour.
   d. Based on 2,000 hours of operation a year, system should last 15 years before expecting a major overhaul.
   e. Some windowless classrooms will require AC with outside temperature at 55 degrees.
   f. AC needs sensed by thermostat and it is not unusual for some rooms to be heated and others cooled at the same time.

Alschuler, John H. "Life Safety . . . Our Primary Concern," American School Board Journal, CXCIV (December, 1964) 20-21.

This article emphasizes the principle that life safety should be a high priority concern in the planning and construction of educational facilities. Schools should protect their occupants from all foreseeable risks to the greatest degree possible.

The author places emphasis on the following recommendations for building codes:

1. Early detection and rapid evacuation in case of fires.
2. Travel distances should be clearly defined and limited.
3. Special attention should be given to direct exterior exiting and protected paths of travel to exits.
4. Omit latching hardware on stairwell doors.
5. Define and separate hazardous areas and reduce fire-protection requirements for ordinary classrooms.

Since no one can assume completely safe operating procedures, the following simple statement of purpose was arrived at for the new code (Building Specifications for Health and Safety in Public Schools, State of Illinois):

1. Early detection
2. Rapid evacuation
3. Multiple paths of escape

This list was expanded into the life safety measures that should be incorporated into any school plant:

1. Early detection
2. Direct exterior exiting, where possible
3. Multiple paths of exit travel
4. Automatic sprinklers
5. Lower flame-spread rating
6. Protected paths of exit travel
7. Reduction of exit travel distance.

Methods of enforcing safety codes should be established so that all new buildings will at least satisfy minimum standards.

"Automated Controls for Schools and College," American School and University. XXXVII (January, 1965), 33-36.

Schools and colleges across the country are turning to automation for more efficient performance and better control of their facilities.

1. New York University uses a one man electronic control console to run mechanical equipment in buildings as far away as one-half mile.
2. Harvard has a similar system which enables one man to sit at a console and operate 67 buildings scattered around the university's North Yard. Two other systems control 40 and 55 building complexes. Plans are to link together these three systems to place 162 buildings at the fingertip control of one man.
3. Texas Tech will have an automated system which will handle 80 buildings sprawled over the school's 900 acre campus.

Purposes of automating control systems:

1. To gain better environment control.
2. To effect savings by controlling heating and air-conditioning.
3. Free maintenance crews for more productive work.
4. Protection of buildings by rapid opening and closing of dampers.
5. Provide a warning system to detect slight drops in building efficiency, and thus pinpointing potential troubles long before breakdown.

For the future, computer-controlled consoles can keep a constant check on campus buildings, in effect closing the school automation loop. Computers will turn mechanical equipment on and off to cope with changing loads, wringing maximum efficiency from the system.

"Before and After the Fire," American School and University. XXXVI (August, 1964), 28-29.

Adequate detection and alarm devices are essential to thorough protection against fire. These devices consist of three elements:

1. An automatic detection device to sound the alarm within the building and to notify the fire department.
2. A mechanism to cut off the ventilation system and automatically close the fire doors.
3. A system to extinguish or control the fire.

Types of detection systems:

1. Thermostatic control - metal strips or springs are actuated when heated to pre-set temperature.
2. Optical detectors - suitable for large open areas.
3. Pneumatic fire detection system - set off by expansion of surrounding air.
4. Ionized particle detector - useful in ventilation systems.

Types of extinguishers:

1. Portable extinguishers
2. Water sprinklers - these have a successful record. The basic disadvantage is that they can cause water damage.
3. Carbon dioxide injectors - will not damage property, but the gas must be distributed in such large concentrations that it constitutes a hazard to life.
4. Dry chemical sprays - often does not prevent reignition.

Blackwell, H. R. "Quality 'n' Quantity of Light and its Increments," American School Board Journal, CL (June, 1965), 32-34.

Quantity and quality of light must be evaluated in terms of their effect on vision. Although the eyeball is not structurally damaged by poor lighting, poor lighting does reduce the effectiveness of information collection and can lead to localized or general discomfort.

A light source concentrated at one point in space will likely produce a large task contrast or wash out contrast and reduce task visibility.

The author recommends as the best lighting system a full ceiling of multilayer polarizers.

Cardinal, R. L. "Acoustics in School Planning," American School Board Journal. CXXXVIII (January, 1959), 37-39.

"Good acoustics is something which is built into a structure, not applied afterwards."

Acoustical fundamentals:

1. Certain "acoustical" materials absorb sound, "but are not efficient in preventing the passage of sound to other spaces."
2. Reverberations - The gradual decay of sound due to absorption burying multiple reflections from walls, ceiling, and floors. They determine whether the room is "live" or "dead." Too much results in confused speech, too little reduces intensity.
3. The efficiency of the absorption materials varies with sound frequency or pitch.

4. Reflections provide reinforcement for the sound by reflecting from walls, ceilings, etc. provided:
    a. The reflection is not too late so as to cause an echo (65 feet of additional travel).
    b. No focusing effects.
5. Sound travels through air, both with the flow and against it, and through solids, such as the materials the school is built of.

An acoustical engineer must be consulted in planning:

Example: Auditorium

1. Shape of walls and ceiling for proper reflection.
2. Good diffusing and elimination of focusing.
3. Recommendation on selection of wall, floor, and ceiling finishes as well as drapes, etc.

Ebaugh, Newton C. "Selecting the Air Conditioning System for Junior Colleges," The florida Architect, XIV (June, 1964), 19.

A comparative look at Air Conditioning Systems.

1. Compact buildings with air conditioning cost same as conventional types without air conditioning.
2. Advantages of air conditioned buildings:
    a. Easy, efficient circulation
    b. Protection from the elements
    c. Free wall space
    d. Accessibility of all areas
    e. Library acquisitions last longer
    f. Lighting control by teacher
    g. Cleaner, less maintenance
    h. Screening unnecessary
    i. Less distractions
    j. Smaller site required
3. Systems:
    a. Package - lowest initial cost, highest operating costs
    b. Single Duct - suited only for large single areas
    c. Multiple Duct or Multizone - best for cooling large number of smaller spaces
4. It has been found that for larger campuses, a central climate control system is more economical than equipment in each building over the long run. The engineer must find the best system in initial cost, operating costs, operating costs and maintenance costs.

Gibson, C. D. "How Gibson's Wheel Measures Light," The Nation's Schools, LXXIV, 57.

A process of rating the following criteria:

1. Daylight brightness
2. Electric light brightness
3. Minimum brightness
4. Reflectance
5. Lighting level
6. Audiovisual

7. Maintenance
8. Operation
9. Capital cost
10. Design integration

After rating the values they are plotted on a wheel or circular graph according to the rating scale. The closer to the outer edge the values fall, the better the rating. The resulting visual profile will dramatize the strengths and weaknesses of the lighting system.

The measurements for the rating are made with a cosine-corrected light meter and are measured in foot lamberts.

Gibson, Charles D. "How to Rate Your School Lighting," The Nation's Schools, LXXIV, 57.

Trends in School Lighting:

1. Illumination engineering has become vision engineering. The amount of light alone does not control how well we see. No longer how many footcandles should be provided, but how source brightness distribution patterns of light flux, relationship of the task being viewed to the light source, and variations within tasks themselves is often more important.
2. New trends in programming, teaching methods, and media must be reflected in lighting. Planning must reflect the trends in class size, team teaching, viewing screens and television.
3. Building components are being integrated. Visual environment can be designed intelligently only if it is coordinated with spatial, thermal, sonic and esthetic.
4. Computers can now accurately determine utilization coefficients and room surface brightness for any lighting system and thereby providing methods of intelligent choice.
5. Low transmission glass is now making reduction of glare and heat loss possible while maintaining visual quality.

Gibson, Charles D. "Today's Concepts in School Lighting," The American School Board Journal, CL (June, 1965), 21-24.

1. Good lighting cannot be planned for without considering also the spacial, thermal, sonic and aesthetic design problems.
2. Brightness balance is the dominant factor in lighting design. Design principles include:
   a. Lighting system should be pleasing.
   b. Brightness of task should be slightly greater than brightness of surrounding area.
   c. The highest brightness of an area in the visual field should not exceed ten times task brightness at from 30 to 50 foot candles.
   d. Surfaces immediately adjacent to the task should be no more than three times not less than one-third task brightness.

   - e. The brightness difference between adjacent surfaces in the visual area should be reduced to an accepatable minimum.
   - f. Direct and reflected glare should not be objectionable.
   - g. Daylight and electric lighting systems should conform to the same brightness limitations.
3. The Task - an important consideration
   - a. Why not encourage pen instead of pencil writing - required light difference 1.38 to 63 foot candles.
   - b. Much can be done to improve seeing conditions with little expense, such as providing high quality duplicated materials.
4. Use instruments to determine level of brightness - not the eye. Psychological factors may be more important in lighting design than physiological factors.

Graybill, E. S. "Resolve three Problems on a Single Plane," American School Board Journal, CL (June, 1965), 38-40.

This article advocates the trend toward the multi-functional ceiling system which consists of "integrated lighting, air heating-cooling, and sound-control devices which are combined structurally, electrically and mechanically to perform the total space-conditioning function."

Three approaches are discussed:

1. Air-handling troffer - units installed at fixed intervals in a conventional acoustical ceiling incorporating the supply of light and air in the same unit.
2. Luminous ceiling - suspended light diffusing panels (may also incorporate facilities for air handling) does away with segmentized light sources and attendant glare problems.
3. Penum-supplied ventilating ceiling - combines factors of the previous two methods and adds a third dimension of depth to the ceiling plane.

Gupta, Hem C. "How to Select a Mechanical System", The Nation's Schools. LXXIV.

The following factors should be carefully considered when choosing a heating and air-conditioning system for a school:

1. Temperature control
2. Humidity control
3. Odor control
4. Noise control
5. Draft-free uniform air distribution
6. First cost
7. Operating cost

The following are the most often used systems:

1. Unit ventilators with self-contained refrigeration units.
2. Unit ventilators with central refrigeration units.
3. All-air single duct reheat system.
4. High velocity double duct systems.
5. Multizone air handling system.

Hill, Frederick W. "The School Business Official Looks at Power and Energy Costs," American School and University, XXXVIII (January, 1966), 71-72.

This article raises areas for consideration regarding the most effective expenditure of funds in providing power and energy to the school plant.

1. Utilities sources are a factor in site selection.
2. What type of energy services should be provided?
   a. Prime power at prime energy rates
   b. Consumer's power at reduced voltage (higher rate)
3. After purchased, how should this energy be distributed within buildings?
4. Should you generate your own energy or purchase it?
5. What choice of fuel shall be made?
   a. Oil
   b. Gas
   c. Coal
   d. Electricity

Hoyem, Gordon E. "Mechanical Systems in Transition," American School and University, XXXVIII (May 1966), 39-43.

"School buildings are in a state of transition as far as mechanical and electrical features are concerned." The future holds more emphasis on quality mechanical and electrical aspects of plant planning. Several aspects of plant design relating to mechanical design are discussed:

1. Rooftop air conditioners
2. Lighting systems that can be readily increased
3. The total energy concept - one fuel supplies all the energy needed for heating, lighting, power, air conditioning
4. RATE - Random Access Teaching Equipment

Hoyem discusses three examples of instances where the planning for the mechanical systems reflect a high degree of versatility and adaptability for future expansion:

1. Covington Jr. H. S. in Birmingham, Michigan - designed by SCSD (School Construction Systems Development). The building "Features a modular and integrated architectural, structural, mechanical, and electrical design, with near-total flexibility in the academic and administrative areas."
2. Lincoln Elementary School in Columbus, Indiana, is a building in which "the engineering systems and the building architecture are coordinated to provide optimum building conditions." It is a school which reflects simplicity in design, operation, and maintenance and optimum comfort control.
3. Sparlingville Elementary School, Port Huron, Michigan, is used as another example of efficient and compacy mechanical construction.

"Classrooms of the future can be built today, and will readily become the classrooms of tomorrow."

Libes, Sol "Sound The Alarm! Smoke's A Killer," The American School Board Journal, CXLIX (December, 1964), 30-31.

1. Since 1900, 800 lives have been lost in school fires with smoke asphyxiation the major cause of death.
2. Every large loss due directly to delayed alarm.
3. Four basic stages for fire development:
   a. Incipient stage - combustion gasses, no flame
   b. Smoke stage - no flame or heat
   c. Flame stage - actual fire, no heat
   d. Heat stage - uncontrolled heat
4. Student lives can be protected only when detection, alarm and evacuation occurs before dangerous combustion gas level is reached.
   a. Detection must occur in incipient stage.
   b. Smoke detectors are recommended which automatically release smoke barrier doors.
   c. In air conditioned buildings the smoke detector should shut down all circulating fans.
5. Types of detectors.
   a. Visible Smoke
      1. Obscured beam - photoelectric cell and projector
      2. Refracted beam - similar to above but light is refracted.
   b. Combustion gas
      1. Ionization - air in a chamber is ionized causing an electric current to flow.
         a. Alarm sounds before thermal and visible evidence of a fire
         b. Preferred type
6. Cost cannot be counted with lives at stake.

"Lighting and Its Effect on Learning," American School and University, XXXVII (January, 1965), 40-42.

Good seeing relates directly to good teaching and learning. Poor lighting can impair vision, cause general body fatigue, and increase body tension. No part of the building program has so direct a relation to human health, human development, and intellectual growth as the design of the lighting system.

The building, the amount and placement of glazing, ceiling height, textures of finish materials, colors of walls, floors, and ceilings, are the total components of a good visual environment.

No lighting fixture or system can be recommended for any specific task. Special areas require special lighting designs. It can be said that a good lighting system should provide the desired level of illumination with reflection from room objects planned to blend into the overall scheme, with brightness controlled and balanced to prevent glare and subsequent fatigue.

The school or college administration can get information concerning lighting from the following two sources:

1. 1962 edition of the American Standard Guide for School Lighting provides the latest recommendations of the illuminating Engineering Society, the American Institute of Architects, and the National Council on Schoolhouse Construction.
2. Manufacturers of lighting equipment - these people have done considerable research on the subjects of lighting and illuminations.

McKay, Ronald L. "How to Keep School Noise at the Right Level," *The Nation's Schools*. LXXIV.

Important consideration for adjustable walled rooms: "A typical speech classroom may be about 30 feet square by ten feet high. These are quite reasonable proportions. Let's assume we have three such classrooms adjacent to one another and separated by movable partitions. We now open the partitions to form a room 30 feet by 90 feet for a large lecture. The new space is still only 10 feet high. A space 90 feet long by 10 feet high is an acoustical tunnel: No one in the rear will hear clearly a speaker at the front. A good auditorium 90 feet deep undoubtedly would be 25 or more feet high and would have a sloped floor. *How useful is flexible space with bad proportions*?"

Morris, John. "Ten Things the Administrator Can Do for Fire Safety," *College and University Business*, XXXIX (October, 1965) 78-80.

The following are things the administrator can do for fire safety:

1. Appoint a qualified fire protection specialist.
2. Determine codes and standards to be followed.
3. National standards should be followed.
4. Incorporate fire safety in building planning.
5. Make a survey of safety problems.
6. Have a fire prevention program.
7. Determine adequacy of local fire department.
8. Develop close working relations with local fire department.

N.A.P.P.A. "Two-thirds of Colleges Plan on Air Conditioning in Next Five Years, N.A.P.P.A. Survey Discloses," *College and University Business*, XXXVIII (March, 1965), 85-86.

The purpose of this study was to assess the present status and outlook for air conditioning in colleges and universities. They found approximately two-thirds of the institutions responding have plans for adding air conditioning.

"Questions and Answers About School Plant Design," Audiovisual Instruction, X (February, 1965), 115.

Light Control--Question: How are window light control installations being affected by use of "grey" or "black" glass, light directing glass bricks, overhanging eaves, outdoor fenestrations, and vision strips, as opposed to wide expanse of glass in order to provide good visibility of projected materials?

1. There is a need for more adequate light control (when glass bricks or tinted glass is used) for protection of the eyes and to make use of all teaching aids possible.
2. Venetian blinds afford control of light and ventilation.
3. Glass curtains on traverse rods are excellent.
4. Roll-down shades of split wood can be made to work quite satisfactorily.
5. Old-fashioned window shades do the job but must be replaced.

Acoustics--Question: Are there on the market movable walls which can prevent sound leaks sufficiently well to enable a sound motion picture to be used in one area without disturbing a group discussion in the other area?

1. Movable partitions perform at almost all levels, offering anything from the approximate acoustical attenuation of a kleenex, to the value of masonry partitions in some cases.
2. Price ranges from $3.00 per sq. ft. to $45.00 per sq. ft. The best is about $5.00 and up.
3. A test of the in-place acoustical performance is the only thing which is capable of determining whether the partition will function as the school expects it to.

Stoneman, Merle A., et al. Planning and Modernizing the School Plant, (Lincoln, Nebraska: University of Nebraska Press), 1949, pp. 206-216, 233-252.

The following are heating and ventilating goals to reach in order to achieve the optimum economy consistent with comfort and health for pupils:

1. Maintain uniform temperature in all school areas.
2. Effect a control of humidity.
3. Circulate sufficient fresh air.
4. Reduce heating at night.
5. Eliminate heating in very mild weather.

The following factors contribute to a successful lighting system.

1. Quality of illumination.
    a. No direct glare
    b. Minimum of reflected glare
    c. Uniform lighting
    d. No shadows
    e. Proper brightness contrast
2. Quantity of illumination for proper brightness.

3. Work surface considered with relation to lighting
4. Comfort

Orientation for natural lighting in classrooms is preferred when light is provided from the southeast and east. Special orientation is required for the following:

1. Sunlight is preferred during entire day for anaemic students.
2. North light is preferred for the dental clinic.
3. Sunlight during the entire day is preferred for toilets.
4. Southern exposure is preferred for playcourts.
5. Sunlight during most of the day is preferred for the gymnasium.

V

ADMINISTERING THE PLANT EXPANSION PROGRAM

Planning

Goode, Mackarness H. "This Bar Chart Makes Long-Range Building Plans a Thing of the Present Before Deadlines are Past," College and University Business, XXXV (October, 1963), 48.

A complex building program at Cedar Crest College involved, almost simultaneously, improvement of plant, additions to existing buildings, and erection of three major structures.

A chart system adapted from building industry practices made it clear to administrators, building committees, architects, and other outside consultants when and why prompt action would be needed from them.

A building chart, prepared in this manner, furnished needed dramatization of the time elements involved. A bar stretching over a calendar of months to the completion date of a proposed building made the passage of future time tangible. The bars are broken into segments to show the finite amounts of time available for each step in planning and construction. A parallel arrangement of the bars representing different buildings shows the overlapping requirements associated with the different building projects.

Sando, Francis A. "Critical Path is Road to Better Building," College and University Business, XXXV (December, 1963), 39-44.

The Critical Path Method (CPM) can be applied to all phases of design and construction as an alternative to the hit-and-miss methods.

The Critical Path Method is a way to control a building project that is serial in nature. Specifically, it is:

1. A method of proving accurate information, about an overall project, in order to formulate sound decisions.
2. A system that uses arrow diagrams to show the interrelationship of variables involved in the job, and mathematical calculations integrate these variables.
3. A tool with which an engineer can effectively control a project to obtain for the owner a minimum project cost.

Financing

Fitch, Keith A. "How to Establish Standards of Quality and Cost for Maintenance," College and University Business, XXXIX (December, 1965), 58-60.

The following rules can be used in making decisions on the question, "When is equipment too old?"

1. Consider only present and future requirements, not past.
2. Consider use value, not book value.
3. Consider trade-in value.
4. Consider likelihood of better equipment becoming available in the future.
5. Consider cost-out labor requirements.
6. Consider capacity of each method.
7. Include interest costs.
8. Consider factors such as tax savings.
9. Convert all cost into common terms.

Furno, Orlando F. "The Cost of Borrowing Money", School Management, IX (July, 1965), 105-107.

1. School officials obligated to save where and when possible.
2. Interest paid determined by:
   - a. Bond market
   - b. Amount of money needed to borrow
   - c. Amount of time to repay loan
   - d. When you want the money
   - e. Your district's credit rating
3. An interest rate difference of 3.3% and 4.8% over 20 years amounts to $157.50 for each $1 million borrowed.
4. Moody ratings for school bonds 1963-64, AAA-2.88% to BA-3.8%.
5. Interest is less when number of years for bonds to mature is least.
6. Professional bond consultant worth his cost.
7. Interest rates fluctuate monthly: In 1958 low of 2.78% to high of 3.76%.
   - a. Interest go up with number of school bonds on market.
   - b. Bond market as a whole, biggest factor on rates.
   - c. Cost of borrowing money can add as much as 40% to the cost of a school.

Heneman, Harlow J. "Planning Comes First; Fund Raising Follows," College and University Business, XXIV (March, 1958), 23-24.

Excellent planning, and not high pressure selling, will, in the long run, produce the results that the university desires. The following list includes matters on which donors should be given honest and objective data:

1. Institutional objectives have been reexamined and restated in specific terms.
2. The curriculum has been reviewed.
3. Over-all enrollment objectives have been fixed.
4. Space utilization has been studied.
5. Building needs have been determined on the basis of equating enrollment projections with potential use of present facilities.
6. Building priorities have been established.
7. Capital fund requirements are projected on the basis of enrollment projections.
8. Projections of income by type and source have been made.
9. Present funds are being used effectively.

"Money", The Cost of a Schoolhouse. Educational Facilities Laboratories. International Press, August 1960. pp. 114-125.

The following points were made concerning the financing of school buildings:

1. Long term borrowing is usually a necessity. Pay-as-you-go and reserve fund financing find little application.
2. Schools must compete for investor funds and usually offer serial bonds in $1,000 denominations, ranging in maturity from one to 30 years. This type of security attracts a wide range of investors.
3. School bonds represent about 1/3 of all municipal bonds offered on the money market.
4. Salability depends upon the credit rating of the offeror, skillful promotion, interest rate, timing of the issue.
5. Most states impose indebtedness limitations against assessed valuation (Fla.=20%) - this limit may be set aside by legislatures or avoided in some cases by lease-back arrangements.
6. In California, school bonds can be taken up by the state with the district receiving flexible repayment terms. Some states have revolving loan funds. In New Jersey, the state is authorized to purchase bonds which may default. Such a statute strengthens the market for bonds of New Jersey districts.
7. There has been a tendency for more and more state control in bond issues for public schools.

Morrison, D. Grant and Martorana, S. V. State Formulas for the Support of Public Two-Year Colleges. Washington, D. C.: U. S. Department of Health, Education and Welfare, 1962.

A report showing the various methods of establishing the two-year college in the United States. Shows 58 different methods used in 42 states. Analyzes and shows the laws, regulations and financial structures used in each of these states. Helpful in finding financial patterns for junior college construction.

Mushkin, Selma J. (Ed.) Economics of Higher Education. Washington, D. C.: U. S. Department of Health, Education and Welfare, 1962.

An investigation of the entire range of economic means for higher education of particular interest is the section on "Financial Resources for Higher Education". A good source book for anyone concerned with finance.

Russell, John Dale, The Finance of Higher Education, Chicago: University of Chicago Press, 1954. pp. 344-345.

Dr. Russell is critical of the emphasis placed upon fund raising for building construction. In this connection, he makes several observations.

1. Although institutions of higher education frequently ask the public for building funds, J.D.R. feels such requests should be at the bottom of the priority list.
2. The public will be freer with its donations for buildings, hence efforts should be concentrated in other areas.
3. Institutions have wasted money on needless plant elaborations. Such monies should have been utilized for faculty salaries, libraries, equipment, etc.
4. Fund appeals should be comprehensive in scope, i.e., for "Building, debt reduction, endowment and current expenses." In this way, administrators can remain flexible in applying resources to changing priorities.

Cost and Economies

Boice, John, Ezra Ehrenkrantz, James McConnell. "Report of the School Construction Systems Development Project," National Council on School-house Construction, 1964. pp. 65-70.

The project was a joint venture of 13 school districts in Northern and Southern California. One hundred manufacturers made bids for a new system of school house construction. The project comprised the construction of 22 separate school buildings.

Briefly, the concepts of the new project were:

1. The use of standard components to build non-standard school buildings. That is, the components would be standard, but the organization of these components into buildings would not be standard.
2. Bids were taken on performance specifications, not on descriptions of products in existence.
3. Creation of the components of specific products was assigned to research and development of departments of industry.
4. The specifications were developed from intensive study of educational requirements in the 13 districts participating, without regard to traditional limitations.
5. Establish performance specifications, these requirements had to be expressed in numerical terms, for example:

    a. A "Mechanical service module" of 3600 sq. ft., divisible into 8 central zones
    b. 70 ft. candles of illumination, low maximum brightness required for good lighting

Objectives of the new approach:

1. Offer architects design flexibility in the meeting of program needs of individual schools.
2. Reduce costs of school construction and give better value for school building dollars.
3. Reduce time needed to build schools.

Although the system permits developing a school building out of standard components, each individual school building is conceived and developed by its own architect in terms of the educational program, community environment, and the site.

Brumbaugh, A. J. "Estimating Capital Construction Costs," Establishing New Senior Colleges. (SREB Research Monograph No. 12) Atlanta: Southern Regional Education Board, 1966. pp. 80-87.

Techniques that may be used to estimate costs of projected physical plant:

1. Method one - cost per full time student using USOE 1965 and California Master Plan for Higher Education 1960, data.
2. Cost per square foot for required space per building per student.
3. Second method is more precise as it requires that space requirements per student per type of building be calculated.

Requirements for space are affected by:

1. Characteristics of institutional program.
2. Methods of instruction.
3. Out-of-class space needs of students and faculty.

Factors affecting construction costs:

1. Size of enrollment.
2. Area building costs.
3. Annual inflation.

Other costs to be considered:

1. Land and site development.
2. Movable equipment.
3. Architect and Engineer fees.
4. Library books (purchase and processing costs.)

"Construction Details and Space Considerations Affecting Economy in School Building Construction," Economics in School Construction, Nashville, Tennessee: The Interstate School Building Service, George Peabody College for Teachers, 1962, pp. 30-35.

The following construction details can be examined closely and at times favorable economies can result.

1. Watch fire insurance rates in choosing structural system and materials.
2. In choosing materials and equipment--watch for ease of access and economy in maintenance.
3. Take advantage of local skills, materials, and construction methods.
4. Use simplicity of design and detail.
5. Use modular design whenever practical.
6. Choice of construction details should be carefully considered in light of need for changing the edspecs.
7. Building parts and materials should serve more than one purpose. Example: Paint and noise deadener.
8. Use a well planned study for basis of building design.

The following can lead to significant space savings in the design and construction.

1. Careful programming--i.e., determine what you need before designing the building.
2. Construct room sizes for class sizes unless planning for increased class size.
3. Pay close attention to circulation and service areas.
4. "The provision of flexibility (sic) within a school can be a very important consideration." (I think that he is referring to multiple-use).

Elliot, L. P. "Plan Ahead for Low Cost Insurance," American School Board Journal, CLIII (December, 1966), 49-50.

There is no excuse to pay high insurance rates on relatively new buildings. Planning before the actual building plans are completed can substantially reduce these costs.

Considerations:

1. Water supply - is it adequate and meet the fire insurance standards for the next lower class?
2. Type of buildings.
   a. Fire resistive
   b. Masonry with wood joist roof
   c. Steel
   D. Frame

It is possible that savings in insurance rates can permit you to build a more substantial building than you might have otherwise.

3. Interior materials
4. Fire walls and other fire containing devices.

There is only one way to save. Examine the rates, sit down and compute the insurance costs for the various alternatives.

Farmer, Margaret. SCSD: An Interim Report. New York: Educational Facilities Laboratories, Inc., 1964.

School Construction Systems Development - to develop a set of standard building components to satisfy three objectives: Better schools, more economy, and more rapidity of construction. Lack of volume has caused a lack of product development specifically for school houses. This raises costs. Britain has had such a system since World War II. California brought 13 districts together in this project. Significance of procedure: Bids were taken on components before buildings were designed; performance specs were used. Package led to cooperation in structural system, air conditioning, lighting/ceiling system and interior partitions.

Fowler, Fred M. "How to Evaluate School Building Costs," _The American School Board Journal_, CXLI (November, 1960), 33.

Defining values and procedures for comparison of buildings is more important than exact cost data.

Seven values to be judges in appraisal of educational buildings:

1. Educational adequacy (space quantity and organization)
2. Safety (structural, fire, panic and accident)
3. Long-time cost economy (maintenance and operation)
4. Aesthetics (social-emotional-psychological climate as influenced by physical facilities)
5. Auditory comfort
6. Thermal comfort
7. Visual comfort

"How Three Districts in Three Parts of the Nation Built Three Schools at Three Different Levels with Three Architects and Three Sets of Educational Specifications all Using One building System," _School Management_, IX (May, 1965) 123-128, 130.

1. School construction systems development (SCSD) designed building components specifically for school needs.
    a. First conceived in California where 13 school districts were involved.
    b. Developed specifications for components.
2. What are components?
    a. Flexible system which can be used by different architects.
    b. Not pre-fab; architect can put components together any way he chooses, but will perform up to specific standards.
    c. Can give higher quality for same cost.

d. Use structural roof system which can provide 3,300 sq. ft. of free-support area.
    1. Also contains mechanical equipment
    2. Flexible ducts for air conditioning and heating can be re-routed and snap out
    3. Snap in lighting plus three types of lighting
    4. Partitions fastened to ceiling and floor can be detached or reanchored
    5. Also self-supporting sound-proof folding partitions are used

Paseur, C. Herbert. Decentralized School vs. Centralized School. (CRS Investigation No. 3) Houston: Caudill, Rowlett, and Scott, 1960.

1. CRS had opportunity to compare two schools in Saginaw, Michigan.
    a. Let on same day to same contractor.
    b. Same structural, mechanical, and electrical systems, materials and construction details.
    c. Both on level sites with approximate soil conditions.
    d. Same educational program and space requirements.
    e. One site is small, necessitating a centralized plan, while the other has a decentralized plan.
2. There are educational reasons for decentralization: Minimize impersonal characteristics, reduce discipline problems, and ease of individualized work.
3. Comparative results:
    a. Construction cost - 3.8% less in centralized
    b. Cost per pupil - $50 less in centralized
    c. Square foot cost - 5.9% less in centralized
    d. Net education area - 0.3% less in decentralized
4. Conclusions: "The decentralized school cost 3.8% more, but we do not have conclusive evidence at this time to say that the cost difference should be the determining factor for planning future schools. Further evaluation may show that the small additional cost may buy a bargain in increased educational performance."

Reid, Kenneth. "The Case for the Basic Space Module," School Planning, II (Oct.-Nov., 1957), 12-17.

1. "Educational policy and human standards progress by constant change in a time dimension. . . Without the inherent characteristics of Time-Flexibility, a school plant, no matter how successful the solution, can only result in unsatisfactory conditions arising as time passes." (13, Architect Ernest Kumpe)
2. "The Basic Space Module for schools is a unit of educational space, so dimensioned as to contain the largest single educational unit ordinarily required for a school and to be, at the same time, susceptible of flexible division into the various combinations of properly sized and functionally related smaller rooms also required for school purposes." (14)

3. The BSM is a unit of space which occurs often enough to be useful and economical.
4. While based on modular principles of design, it still avoids standardization by allowing variety in systems, materials and arrangement. There is no set size. The structural elements are completely independent.
5. Service is "self-energized" or contained within each BSM. Skylights are used for supplementary lighting.
6. The BSM is an idea, not a proscription. It may be adapted in many ways.

Weinstock, Ruth. Space and Dollars: An Urban University Expands. New York: Educational Facilities Laboratories, 1961.

Drexel Institute's study for expansion - 1958 to 1960.

1. At $4.50 per square foot for land, a detailed study should be made for high rise structures.
2. Gearless elevators limit economical buildings to 12 floors.
3. Cost factors in high rise construction:
   a. Purchase and installation of elevators.
   b. Use of building.
   c. Building code requirements.
   d. Heavier structural members
   e. Larger ventilating ducts
4. This study was based on cost of 7 story building.
5. Lower cost factors:
   a. Foundations
   b. Excavation
   c. Roof and flashings
   d. Maintenance/Custodial work
   e. Landscaping
   f. Bringing utilities to building
6. The need must be based on:
   a. Cost of land
   b. Availability of land where needed
   c. Cost of vertical transportation